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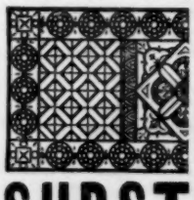

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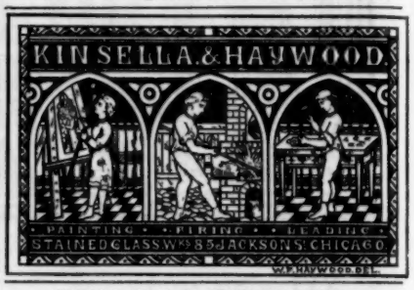

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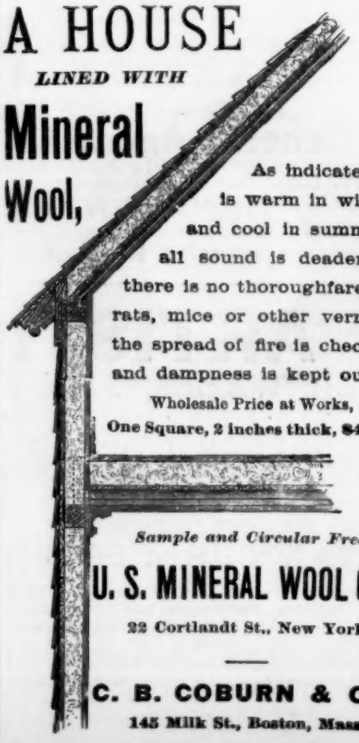

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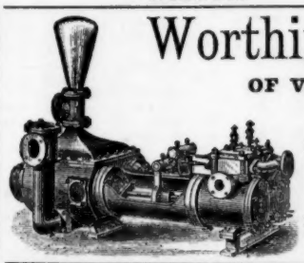

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Cash Capital	$1,000,000.00
Reserve for Re-insurance	635,741.16
Reserve for all other Liabilities,	96,655.57
Net Surplus	832,744.56
Total Assets, January 1, 1883	2,565,141.29

BUILDING MATERIALS.
Reported for the American Architect and Building News.

BRICK. — ℔ M.	New York. (Wholesale Prices.)	Boston. (Prices to Builders and Contractors.)	Chicago. (Prices to Builders and Contractors.)	Philadelphia. (Prices to Builders and Contractors.)
Common: *Cargo afloat.*				
Pale	$2 50 @ $3 50	Eastern	Building Brick	Hard
Jersey	4 50 @ 5 25	7 50 @ 8 00	6 50 @ 7 50	8 00 @ 8 50
		Bay State Hard		Salmon
Up River	5 00 @ 5 75	9 00		5 00 @ 6 00
Haverstraw Bay	5 75 @ 6 25	Domestic Com.	Indiana Pressd	Stretchers
" 1st	6 25 @ 6 50	8 00 @ 9 00	16 00 @ 28 00	11 00 @ 14 00
		Domestic Face	St. Louis Fronts	Pressed
Fronts:		19 00 @ 20 00	25 00 @ 30 00	20 00 @ 24 00
Croton, Brown	13 @ 14 00	Philadelphia		
" dark	14 @ 15 00	40 00 @ 45 00		
" red	14 @ 15 00	Phila. mould		
Chicago pressed		50 00 @ 80 00		
Chicago Moulded			22 00 @ 35 00	
Baltimore	37 @ 41 00		65 00 @ 350 00	
Glens Falls — white	30 @ 35 00	Glens Falls	50 00 @	
Philadelphia	@ 27 00	25 00 @ 26 00		
Trenton	@ 27 00		42 00 @	
Milwaukee		Glens Falls	40 00 @	
Moulded:		Mould.	25 00 @	
Clark's Glens Falls — Red	25 00 @ 27 00	30 00 @ 35 00	60 00 @ 100 00	
" — White	30 00 @ 35 00	35 00 @ 40 00	30 @	
White " Mold	45 00 @ 60 00	45 00 @ 60 00	35 @	
Enamelled: *Imp.*			55 00 @ 65 00	
Enamelled (edge.)	85 00 @ 100 00	@	@ 100 00	
Enamelled (edge and end)	90 00 @ 115 00	@	@ 125 00	Dom. @ 70
				@ 85
CEMENT, LIME, etc.—(℔ *cask.*)				
Chicago Lime in bulk			65 @ 75	
Wisconsin "			80 @ 90	
Rosendale Cement	80 @ 1 00	@ 1 50	*Not Sold.*	1 25 @ 1 65
Utica, Akron, Buffalo, Louisville, Milwaukee	*Not sold.*	*Not sold.*	1 00 @ 1 25	*Not sold.*
Portland (English)	2 60 @ 3 10	@ 3 20	2 75 @ 3 00	2 80 @ 3 50
" (Saylor's Am.)	2 05 @ 2 40	2 50 @ 3 00	2 75 @ 3 00	2 50 @ 3 00
" (Dyckerhoff)	2 75 @ 3 15	3 00 @ 3 50	3 25 @ 3 75	3 00 @ 3 25
" (Lafarge)	3 50 @ 3 75	*Not sold.*	3 75 @ 4 25	4 50 @
" (Star)	2 70 @ 3 00	*Not sold.*	*Not sold.*	*Not sold.*
K. B. & S. (Eng.) Portland	2 85 @ 3 10		3 35 @ 3 50	3 00 @ 3 25
Burham " "	2 60 @ 2 80		3 15 @ 3 35	2 75 @ 3 00
Vorwohler	2 65 @ 3 25		3 00 @ 3 25	
German (Fewer)	2 50 @ 2 70	3 15 @ 3 35	3 15 @ 3 35	
" (Alsen)	2 80 @ 2 80	3 00 @ 3 50	3 15 @ 3 35	2 90 @ 3 25
Scientific		1 65	*Not sold.*	
Hydraulic Lime of Teil	3 50 @ 4 00		*Not sold.*	
Roman	2 75 @ 3 00	@ 3 20	2 75 @ 3 25	3 25 @ 3 50
Keene's coarse	5 00 @ 6 00	@ 7 50	7 50 @ 9 00	6 50 @ 7 00
" fine	9 25 @ 10 25	@ 11 50	11 00 @ 12 50	11 50 @ 12 00
Lime:				
Rockland and Rockport, (Com.)	@ 1 00	@ 1 10	*Not sold.*	1 00 @ 1 25
Rockland and Rockport, finish	@ 1 20	@ 1 15	*Not sold.*	
State, com. cargo rates (nom.)	75 @ 80	*Not sold.*	*Not sold.*	*Not sold.*
State, finishing "	@ 1 00	*Not sold.*	*Not sold.*	*Not sold.*
Plaster of Paris (calcined.)	1 30 @ 1 35	1 70 @ 1 90	@ 1 75	1 60 @ 2 25
" (casting)	1 50 @ 1 65	@ 2 25	@ 2 00	2 25 @ 2 50
Hair (Cattle) ℔ *bush*	21 @ 23	@ 30	30 @ 35	24 @ 30
" (Goat)	30 @ 35	@ 30	35 @ 40	@
Sand, ℔ *load*	1 00 @ 1 25	@ 1 50	100 @ 1 25	75 @ 1 50
STONE. (℔ *cubic foot, rough.*)				
Granite: (*Maine*)		@ 60		
Limestone:				
Bedford	@ 1 00	95 @ 1 00	50 @	3 75 @
Joliet	@		35 @ 55	
Lemont	@		35 @ 60	
Serpentine			80 @ 90	

(*Continued on page vi.*

10

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BUILDING MATERIALS.

	New York. (Wholesale Prices.)	Boston. (Prices to Builders and Contractors.)	Chicago. (Prices to Builders and Contractors.)	Philadelphia (Prices to Builders and Contractors.)
Foundation:				
Dimension	@	5 00 ℔ ton	20 @ 28	30 @ 5 00
Block	@	4 60 ℔ perch	8 50 ℔ cord.	50 @ 6 00
Rubble	@	1 25 @ 1 50	8 50 @	
Bluestone: (℔ *sq. ft.*)				
Sidewalk	30 @ 5 00	40 @ 1 75	75 @ 1 00	70 @ 90
Planed	50 @ 6 00	75	50 @ 1 00	1 10 @ 1 25
Sandstone.				
Longmeadow		75 @ 85		
Brown (Connecticut)	1 00 @	1 25 @ 1 45	1 50 ℔ cub.ft.	
Amherst	1 00 @	90 @ 1 00	55 @ 65	
Berea	75 @ 1 00	80 @ 90	45 @ 55	70 @ 90
Berlin	75 @ 1 00	80 @ 90	55 @ 65	
Bay of Fundy	@ 1 00	*Not sold*	*Not sold.*	
Belleville	80 @ 1 25	1 25 @ 1 35	"	
New Brunswick	@ 1 00	90 @ 1 00	"	
Caen	@	@ 2 00	"	
Marble:				
Lee, Mass.	@	1 75 @ 2 50	*Not sold.*	2 00 @ 2 50
Rutland, white	@	@ 3 00	3 50 @ 5 00	2 25 @ 2 50
Sutherland Falls	1 25 @ 1 75	@ 2 00	3 50 @ 5 00	1 50 @ 2 50
Glens Falls, black	@	2 00 @ 3 00	*Not sold.*	4 00 @ 4 50
Italian, blue-veined	@	50 @ 60	@ 4 40	— @ —
" Sienna	@	3 00 @ 3 50	*Not sold.*	3 25 @ 6 50
Tennessee, red	@	1 25 @ 2 50	@ 4 00	2 00 @ 3 00
" Knoxville	@	85 @ 90	@ 4 00	@ 1 50
Pennsylvania, blue	@		*Not sold.*	2 23 @ 2 50
Vermont, white	@	1 50 @ 2 00	3 50 @ 5 00	
Slate:				
Roofing, (℔ *square*)	@			
" green	7 00 @ 8 00	4 50 @ 7 00	6 25 @ 8 10	@ 7 00
" purple	7 00 @ 8 50	5 50 @ 6 50	@ 8 60	@ 7 00
" red	@ 15 00	13 00 @ 14 00	— @ 16 00	5 00 @ 5 75
" black, Lehigh	— @ —	*Not sold.*	7 20 @ 7 60	5 00 @ 5 75
" " Chapmans	— @ —	*Not sold.*	7 30 @ 8 00	6 00 @ 6 25
Tiles, Am. ℔ M.	@		*Not sold.*	@ 15 00
LUMBER.—℔ M. (*Ordinary dimensions.*)				
Boards:				
Pine, 1st quality, clear	65 00 @ 75 00	50 00 @ 53 00	44 00 @ 49 00	
" 2d quality	55 00 @ 60 00	42 00 @ 44 00	40 00 @ 46 00	
" 3d quality	18 00 @ 22 00	35 00 @ 38 00	37 00 @ 44 00	
Spruce	@ 25 00	11 00 @ 12 50	*Not sold.*	
Hemlock	ea. 17 @ 18	12 00 @ 12 50	@ 10 00	11 50 @ 15 00
Yellow pine	20 @ 40	30 00 @ 33 00	@ 28 00	16 00 @ 18 50
Cypress	@	@ 35 00	@	@
Clapboards:				
Pine	@	33 00 @ 55 00	14 00 @ 22 00	—@—
Spruce	@	23 00 @ 30 00	*Not sold.*	—@—
Framing Timber:				
Pine			13 00 @ 15 50	25 00 @ 35 00
Spruce	14 00 @ 18 00	13 50 @ 14 50	*Not sold.*	18 50 @ 20 00
Hemlock	12 00 @ 15 00	@	13 00 @ 19 00	12 00 @ 13 00
Yellow pine	20 00 @ 30 00	21 00 @ 25 00		22 00 @ 24 00
Laths:				
Pine	@	2 00 @ 2 25	2 25 @	—@—
Spruce	2 25 @ 2 30	2 00 @ 2 25	*Not sold.*	2 40 @ 2 60
Shingles:				
Pine, shaved	5 00 @ 6 00	@	*Not sold.*	
Pine, sawed	4 00 @ 5 60	@ 4 50	2 25 @ 2 60	
Spruce, sawed	2 50 @ 2 75	@ 1 50	*Not sold.*	
Redwood	2 10 @	@ 3 00	5 50 @ 8 00	30' $10 @ 28
Cedar, split	@	@	*Not sold.*	24" 8 @ 21
Cedar, sawed	@	2 00 @ 3 50	@ 2 30	20" 5 50 @ 14
Cypress 7 x 24	18 00 @ 20 00	5 50 @ 6 00	*Not sold.*	16 00 @ 20 00
Miscellaneous:				
Piles ℔ ft.	4½ @ 6	Piles 6c. ℔ ft.	*Not sold.*	
Fence pickets, Spruce	8 00 @ 10 00	10 00 @ 18 00	Pine, 8 @ 22	12 00 @ 14 00
Cedar posts, 9 ft. (sq. posts.)	@	25 @ 35	9 00 @ 21 00	70 @ 1 25
Chestnut "	@	25 @ 35	*Not sold.*	28 @ 36
Finishing Woods: ℔ M. (*First Quality, Kiln-dried.*)				
Ash	@ 55 00	38 00 @ 48 00	35 00 @ 40 00	
Cherry	80 00 @ 120 00	60 00 @ 90 00	75 00 @ 85 00	55 00 @ 65 00
Chestnut	@ 55 00	38 00 @ 50 00	45 00 @ 50 00	60 00 @ 80 00
Butternut	40 00 @ 60 00	60 00 @ 70 00	45 00 @ 60 00	55 00 @ 65 00
Mahogany, Baywood	@ 180 00	100 00 @ 150 00	150 00 @ 180 00	100 00 @
" St. Domingo	@ 350 00	180 00 @ 250 00	250 00 @ 300 00	
Maple	45 00 @ 50 00	45 00 @ 65 00	30 00 @ 35 00	30 00 @ 50 00
Oak, red	@ 70 00	@ 50 00	35 00 @ 40 00	35 00 @ 45 00
" white	@ 70 00	@ 55 00	35 00 @ 40 00	55 00 @ 65 00
" quartered	@ 90 00	65 00 @ 70 00	50 00 @ 55 00	70 00 @ 80 00
Sycamore quartered		@ 65 00		
Pine, clear	65 00 @ 70 00	30 00 @ 65 00	45 00 @ 50 00	65 00 @ 90 00
Redwood	70 00 @ 75 00	60 00 @ 70 00	60 00 @ 70 00	100 00 @
Rosewood ℔ lb.	@ 6		@ 7	
Walnut, black	125 00 @ 150 00	85 00 @ 100 00	80 00 @ 120 00	160 00 @ 200 00
Whitewood	45 00 @ 50 00	38 00 @ 45 00	30 00 @ 35 00	20 00 @ 30 00
Yellow pine ℔ M.	@ 45 00	40 00 @ 45 00	30 00 @ 35 00	30 00 @ 35 00
Gumwood, best red			30 00 @ 35 00	
PAINTS. (*In oil,* ℔ *lb.*)				
White lead, Am.	6½ @ 6¾	5¾ @ 6½	6¼ @ 6½	4 @ 6½
" Zinc, "	5 @ 8½	8 @ 12	7 @ 11	4 @ 8
Red, Am.	6 @ 6¾	@ 12	*Not sold.*	
" Venetian	6 @ 10½	7 @ 12	1¾ @ 2¼	4 @ 6½
" Vermilion	55 @ 60	55 @ 60 dry	50 @ 75	Am. 12 @ 16
Red Indian, Eng.	12 @ 20	14 @ 20	12 @ 20	12 @ 16
Yellow Ochre	6 @ 15	7 @ 12	3 @ 15	4 @ 9
" Chrome	12 @ 20	18 @ 25	12 @ 25	12 @ 25
Green (chrome)	8 @ 13	12 @ 20	8 @ 20	9 @ 14
Green, Paris,	16 @ 20	25 @ 40	16 @ 35	14 @ 29
Black, lamp	8 @ 12	15 @ 25	8 @ 30	12 @ 18
Blue, ultramarine	12 @ 18	18 @ 30	10 @ 35	20 @ 35
Oil, linseed, (raw) (℔ *gals.*)	53 @ 54	54 @ 59	57 @ 60	54 @ 58
" " boiled	56 @ 57	57 @ 62	60 @ 62	57 @ 60
Turpentine	30 @ 31	36 @ 43	35 @ 38	38 @ 41
Varnish, coach	@	1 50 @ 6 00	1 25 @ 2 00	1 40 @4 00
Shellac	@	2 50 @ 3 00	3 25 @ 4 00	1 75 @3 00
Putty	2 @ 3	2 @ 4	02 @ 03	2 @ 2½
Whiting (*dry*)	50 @ 90	1 @ 1½	1 @ 2	¼ @ 7-10
Paris white, (Eng.,) (*dry*)	30 @ 2 00	2 @ 3	2 @ 2½	1 30 @1 60
Litharge, Am. (*dry*)	5½ @ 5¾	6½ @ 7	6½ @ 10	6½ @ 7
Sienna, (burnt) (*dry*)	12 @ 17½	14 @ 20	4 @ 16	9 @ 14
Umber, " (*dry*)	11 @ 16½	14 @ 20	@ 10	9 @ 14

(*Continued on page* vii.)

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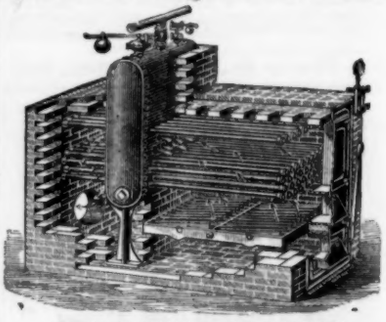

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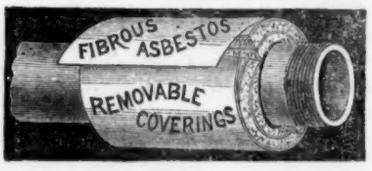

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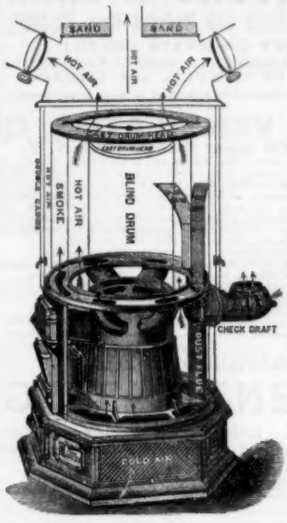

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THE NOVELTY FURNACE
as its economy, prolonged durability and convenience, together with the cleanliness, secured by the dust-flue, and the sand-joints preventing all possibility of the escape of dust, gas or smoke assures
ITS SUPERIORITY AS A VENTILATING APPARATUS
which is due to its original, peculiar, and superior construction and arrangement of the heating surfaces to the extent that it exposes a greater space of surface than any of its competitors, all parts of which is economically raised to an even and high temperature for a period of prolonged duration enabling it to supply a large volume of pure, warm air constantly, an evidence of
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derived from one centre drum, directly over the fire filled with reflected, surrounded by an outer drum, with an air space between, the outer drum receiving the ignited gases and products of combustion from the fire through hollow arms leading into the bottom of the drum which are made to heat thoroughly the entire surface by an inverted partition, deflecting them toward the front where they rise and pass over the partition and out, securing a result that is
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This radiator is constructed upon the principle *of a coil* A diaphragm separates one leg of the loop from the other so that steam entering passes up one leg to the top of the loop, down the other leg to the opposite side of the diaphragm, thence into the next loop, and so on through the Radiator, securing a PERFECT CIRCULATION and an IMMEDIATE heating of the whole Radiator. It is adapted to **High** or **Low** pressure, and surpasses all others in the **perfection** of its operation, beauty of design, and simplicity of construction. The loops or sections are made complete and independent of each other, and each loop is screwed to the adjacent loop by a double-thick wrought-iron nipple, thus forming a perfect joint not affected by contraction or expansion.

No packing is used, and there are but **two joints** in each four feet of heating surface (36-inch size), while the ordinary pipe radiator has **eight joints.** It has the largest radiating surface of any in the market to space occupied.

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Shingle	@ 4 25	@ 3 40	@ 3 35	@ 3 95
Lath	@ 5 75	@ 4 60	@ 5 60	@ 4 70
(*Finishing nails according to size.*) (*For casing nails add 75c. per keg.*)			Add $1 50	Add 1 00 pr cask
Butts: 4″x 4″ (℔ doz. pairs.)				
Plain	@ 1 50	@ 1 20	65 @ 1 00	@ 1 30
Japanned	@ 2 50	@ 1 75	*Not sold.*	@ 1 75
Acorn, Japanned	@ 2 50	@ 2 50	2 00 @ 3 75	@ 2 00
Acorn, Boston finish (℔ pair.)	@ 75	@ 75	*Not sold.*	@ 65
Bronze metal	@ 2 00	plain 2 25	2 00 @ * 3 25	@ 1 75
Brass (for cupboards)	@ 15	@ 10	@ 12	@ 15
Knobs: (℔ *Set.*)				
Mineral, best	@ 15	@ 10	8 @ 10	@ 10
Lava	@ 50	@ 75	65 @ 80	@ 1 00
Hemacite	@	@ 38	31 @ 40	@ 27
Porcelain	@ 40	@ 12	25 @ 30	@ 30
Glass, solid	@	@ 75	*Not sold.*	*Not sold.*
Glass, silvered	@ 1 75	88 @ 1 50	@ 1 50	@ 1 75
Bronze metal	1 00 @ 4 00	88 @ 2 00	75 @ 2 50	90 @ 3 00
Brass	1 50 @ 3 00	88 @ 2 00	1 50 @ 3 00	@ 1 25
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Pipe: (*Per Foot.*)				
Cast-iron, 4″, d'ble thick 5 ft. length	4 05 @	@ 75	75 @	@ 75
Cast Iron, 2″ d'ble thick 5 ft. length	2 05 @	@ 35	35 @ 40%	@ 35
Cast Iron 4″ single thick	3 04 @	@ 36	36 @	@ 36
" 2″ " "	1 05 @	@ 24	24 @	@ 24
Wrought-iron, plain, 2″	46 @	@ 26	46 @	@ 46
" " 1″	19 @	@ 8	19 @	@ 19
" " ½″	11 @	@ 4½	11 @	@ 11
" enamelled 2″	64 @	@ 64	24 @	
" " 1″ 45%	28 @	@ 20	28 @ 70%	
" " ½″	15 @	@ 11	25 @	
Galvanized-iron, 2″	64 @	@ 30	64 @	@ 64
" 1″	28 @	@ 10½	28 @	@ 28
" ½″	15 @	@ 06	15 @	@ 15
Brass, drawn, ⅝″	30 @	@ 25	70 @	
" ½″	25 @	@ 30	75 @ 25%	
" ⅜″		@ 45	75 @	
Lead: (*Per lb.*)				
Pipe 10%	6½ @	@ 5½	6½ @	6½ @
Sheet	7½ @	@ 6½	7½ @	7½ @
Traps, S 4″ each	1 90 @		1 90 @	1 90 @
" S 2″ "	1 10 @		1 10 @	1 10 @
" ½ S 4″ "	1 55 @		1 55 @	1 55 @
Bath Tubs: (*Tinned and Planished.*)				
Copper, 16 oz. 6 ft. 30%	19 75 @	@ 19 75	19 75 @ 25 %	@ 19 75
" 14 oz. "	17 75 @	@ 17 75	17 85 @ 25 %	@ 17 75
Bath Boilers: (100 *lbs. pressure.*)				
Copper, 16 oz., 40 gals. 30%	28 00 @	30 gals @ 18 00	24 00 @ 20 %	@ 34 00
" 14 " 40 "	32 00 @	40 " @ 21 00	24 00 @ 55 %	@ 32 00
Galvanized-iron, 40 gals. 55%	24 00 @		24 00 @ 55 %	@ 24 00
Solder:		16 00 @ 17 00	13 00 @ 15 %	
Iron:				
I-Beams up to 12″	@ 4	3½ @ 4	@	
I-Beams above 12″	@ 4	3½ @ 4	@ 4	30% 3½
Channel-Beams up to 12″	@ 4 2-10	3½ @ 4	@ 4	

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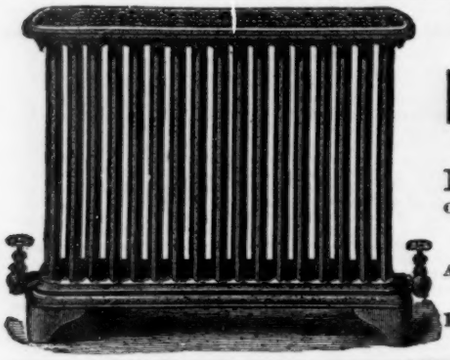

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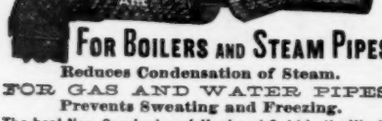

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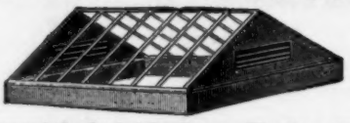

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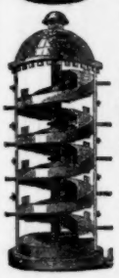

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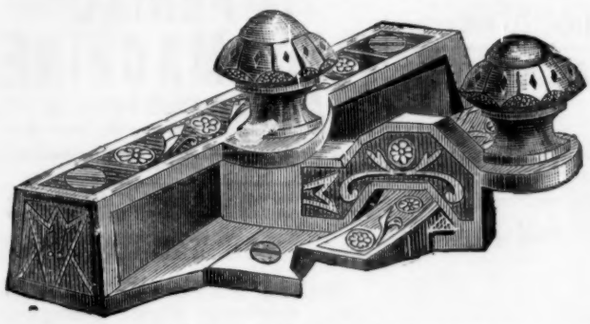

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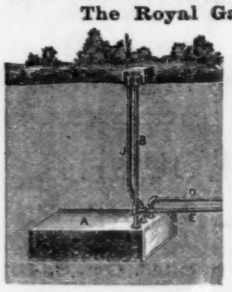

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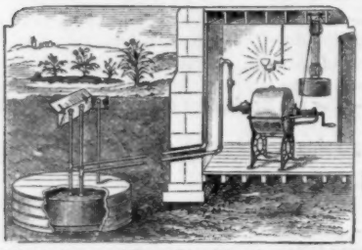

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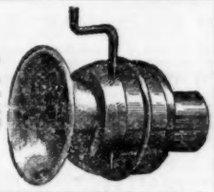

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PLASTERER	3 50 @	@ 4 00	@ 4 00	@ 3 50	4 00 @	2 75 @ 3 00	4 00 @ 4 50
Stucco-Worker	4 00 @	@ 4 00	3 25 @ 4 00	3 00 @ 3 50	4 00 @	2 50 @ 3 00	4 00 @ 4 50
PLUMBER	2 50 @ 3 50	3 00 @ 3 50	3 25 @ 3 50	3 00 @ 3 50	4 00 @	@ 3 00	3 50 @
QUARRYMAN	1 25 @ 2 00	@ 1 75	1 50 @ 2 00	.....	2 50 @	.....	2 50 @
Stone-Mason	3 00 @ 3 50	2 75 @ 3 00	3 00 @ 3 50	@ 3 50	4 00 @	@ 3 50	4 00 @
Carver	3 50 @ 4 00	p'ce 4 00	3 75 @ 4 00	5 00 @ 10 00	5 00 @	3 50 @ 4 00	Piece.
Pointers and Washers	1 50 @ 2 00	2 50 @ 3 00	2 75 @ 3 00	@ 2 50	2 75 @	1 75 @ 2 00	3 00 @
Rubber	1 50 @ 2 00	1 75 @ 2 00	1 75 @ 2 00	2 00 @ 2 50	2 50 @	@ 2 00	3 00 @
Stone-Cutter	3 00 @ 3 25	@ 3 50	3 25 @ 3 50	3 00 @ 3 50	4 00 @	3 00 @ 3 25	3 50 @
Stone-Setter	3 00 @ 3 25	@ 3 50	3 25 @ 3 75	3 50 @ 4 00	4 50 @	.....	3 50 @
ROOFER (Tin)	1 50 @ 3 00	@ 2 75	2 50 @ 2 75	50 @ 3 00	2 50 @ 3 00	@ 2 50	2 50 @
Slater	2 50 @ 3 00	@ 2 75	2 50 @ 2 75	00 @ 3 50	2 50 @ 3 00	@ 3 00	3 50 @
STAIR-BUILDER	2 50 @ 2 75	2 25 @ 3 00	3 00 @ 3 50	50 @ 2 75	3 00 @ 3 25	@ 2 50	3 00 @
STEAM-FITTER	2 50 @ 3 00	2 50 @ 4 00	2 75 @ 3 00	2 00 @ 2 50	3 50 @	@ 3 00	3 00 @

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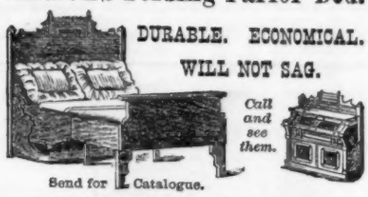

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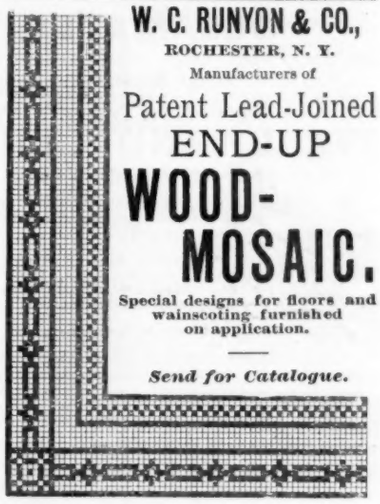

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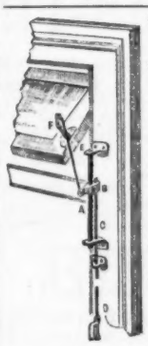

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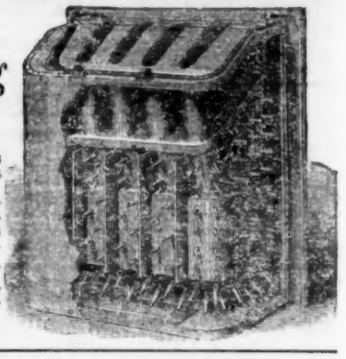

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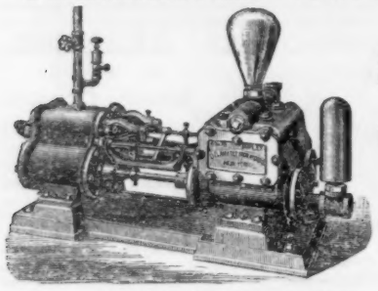

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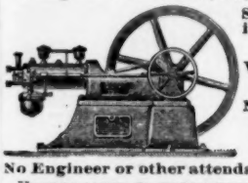

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OCTOBER 11, 1884.

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A DISCUSSION which recently took place in Boston in regard to the possibility of employing irrigation as a method for disposing of the sewage of that city, seems to have excited, as such discussions generally do, a great deal of interest. It is hardly necessary to say that any proposition for applying a system of utilization to the waste waters of so large a city is opposed by the most experienced engineers, not, usually, on account of any prejudice on the subject, but because they know better than any one else the difficulties which must be overcome in dealing with so great a volume of liquid, and, considering the present state of knowledge, they are right. If those who, like ourselves, hope some time to see the fertilizing products of organic life generally restored to the soil from which they have been derived, would turn their enthusiasm and energy toward the propagation of their views in small towns and among individual proprietors, where experiments at a small scale could be carried on with little trouble or expense, they might be sure of doing great and immediate good, and, by familiarizing the public mind with the idea of sewage utilization, as well as by the accumulation of knowledge concerning the best methods of carrying it out, they would prepare the way for applying it, years hence, with an adequate knowledge of the results to be sought and the means for securing them, to the wastes of large communities.

THE form of drainage apparatus which concerns the greatest number of people, and most needs reform, is not the intercepting-sewer, the tidal-outfall, or the inverted-siphon, but the cesspool. At this moment hundreds of people are moaning or shrieking in the delirium of typhoid fever, which they have contracted through the intervention of one of these reservoirs, and will probably communicate it to some of their friends and neighbors by means of another one; and no one could do a greater service to his fellow-men than to show them the way to abolish forever the source of so many evils, by the substitution of a satisfactory and inexpensive system of irrigation. A great deal has already been accomplished in this way, without special effort, but there is much work to do yet among householders of moderate means, who fear to introduce new appliances, of which they do not know the cost or the permanence, as well as among the timid, who are still haunted by the absurd notions set afloat in the early days of sewage utilization. We have learned to laugh at the idea of celery-stalks at Gennevilliers spouting sewage when cut, and Pasteur's experiments have long ago set at rest our apprehensions that cholera or typhoid germs might be liberated from sun-dried sewage and float in the air to our injury; but every one has not followed the progress of sanitary knowledge, and those who have not are sure to be glad of information, and will generally be ready to follow, to the extent of their ability, any reasonable plan for improving the health of their families. Those who would be the missionaries of the new movement must, however, first make themselves thoroughly acquainted with facts. It is worse than useless to make hasty assertions, without actual experience to confirm them, and no one ought, in so important a matter as house-drainage, to advise the adoption of any plan which he has not himself tried successfully.

MR. KEELY has given a new proof of his extraordinary capacity for keeping up the spirits of those who furnish the money for carrying on his "studies," by collecting a large number of them at the Government station on Sandy Hook to witness some experiments with a "vaporic gun," which he has been for some time constructing. It seems that the "generator," which formed the subject of the great inventor's original efforts, after costing the stockholders of the company sixty thousand dollars, has been sold as old metal for two hundred, and the present exhibition appears to have been ingeniously planned for removing, at a small expense, the unfavorable impression which might have been produced by the previous piece of financial management. According to the reporter of the New York *Times*, who accompanied the party to Sandy Hook, Mr. Keely's new artillery consisted of a gun with a bore of one and one-quarter inches, mounted on wheels; an iron receiver a yard and half long, containing "five gallons of vaporic force," and a small intensifier. On reaching the testing ground the receiver was connected with the gun by a small wire tube, apparently resembling the steam-hose often used for similar purposes, and a bullet was inserted. The gun was then, after rapping the receiver with a hammer "to stimulate the vaporic force," pointed, and a handle was turned, upon which the bullet was projected, with a slight noise, to a distance of three hundred yards. The next shot struck the target, and several others were fired, three of which, by test with the Government instruments, showed the initial velocity to be one third as great as that of a ball from a Springfield rifle. The pressure used, according to the reporter's rendering of Mr. Keely's explanation, was "seven thousand feet to the square inch," but he remarked that a much greater force could be obtained.

A DAY or two afterwards, the great inventor condescended to explain to a reporter of the Philadephia *Press* some of the properties of the apparatus used in his experiments in gunnery. According to the reporter's account, Mr. Keely professed to have succeeded in developing a "power of projection" "thrice greater than that of gunpowder," although he did not state why this "power of projection," as exhibited, was only a fraction of that which gunpowder would have given under the same circumstances. However, he did better than that, in taking from his satchel and showing to the reporter what he called a "vibrator," the source of his extraordinary power. This vibrator, which was shaped like a short round stick, contained as he said, a "hollow coil of steel," which, on the stick being held near the reporter's ear, gave out a humming sound. This humming, the inventor went on to say, proceeded from vibrations in the steel, induced "by the flow of vapor through it," and was due to vibrations, taking place at the average rate of three hundred thousand per second. As this, according to a little calculation which we have made, would correspond to the rapidity of vibration of a string producing the highest note of a piano ranging six octaves above the usual key-board, our readers may imagine for themselves the character of the "humming," but it appears that this, whatever it might have been like, was capable of producing in the stick a continuous force of five hundred horses. With unusual confidence, Mr. Keely then proceeded to explain the method of preparing the "vaporic force" used in the Sandy Hook trial, saying that six drops of water, and about a pint of air, had sufficed to produce five gallons of "etheric vapor," of such lively disposition that after firing by means of it about twenty bullets, the power in the reservoir was found to have increased, rather than have diminished, "just as a race-horse needs to be warmed up before he can do himself justice." The way in which the ether is applied to the gun, as he says, is "to get the chord of vibration of the gun to agree with the chord of the vibrator." This is done, after allowing the "interatomic ether to pass into the gun" behind the bullet, by striking the gun with a mallet. At the same time the steel coil is attached, which "increases the intensity of the vibrations fifteen-fold," and the bullet is consequently shot out of the gun with much force. Much more of this lucid information was given to the reporter by the condescending genius, but what we have quoted will be quite enough to show the general drift of the discourse. In point of fact, the vaporic artillery seems

to have been nothing more nor less than a stout air-gun, fired in a well-known way by compressed air from the reservoir. The latter, being evidently of great strength, might be charged with air enough to fire a large number of bullets, and, although the tension would decrease as the air was consumed, a suitable control of the discharge valve could readily be made to give a greater initial velocity to the last bullet fired than to the first, and thus produce the impression that the motive force had got "warmed up" toward the end of the exhibition. The coiled steel vibrator, which was attached to the gun to "increase the intensity of the vibrations," was probably a mere blind, to take the attention of the spectators away from the obvious character of the apparatus.

THE last chapter of the Des Moines episode is a sad, yet not an unexpected one. The actual writer of the extraordinary circulars of the Des Moines Architectural Association, which we have felt called on to publish as being the official utterances of an architectural society, has been placed in an insane asylum, where we hope he will find cure or relief for his terrible affliction. That a man beside himself should have written these circulars we can readily understand, but we cannot conceive how his condition could have escaped the observation of his associates so far as to allow them to accept his compositions as sane utterances, and, moreover, adopt and issue them with all the pomp of official signature and counter-signature. It is possible that the hallucination of the unfortunate man was such that he believed his circulars were accepted, and then issued them at his own expense and responsibility. But even then we cannot see why some of our readers in Des Moines did not advise us of the true state of the case; unless, indeed, the Des Moines Architectural Association itself is the phantom of a diseased brain and, of course, no one could have knowledge of its proceedings.

WHOSE sentimental persons who fancy they would like to live in a picturesque Swiss châlet may like to know that their taste can now be gratified at a small expense; a company at Interlaken, in the very heart of the portion of Switzerland most distinguished for its beautiful wooden houses, having undertaken the manufacture of châlets for sale, the parts being fitted together, numbered, and packed in small compass, ready for setting up wherever the purchaser may fancy. This method of manufacture is peculiarly adapted to the Swiss houses, since the whole principle of their construction is that of fitting together, by ingenious mortising and dovetailing, without the use of nails, which, even at this day, have very little to do with châlet-building. Viollet-le-Duc believed that these houses were practically identical in style and construction with those built by the Aryan invaders of Europe, ages before the discovery of iron, but however that may be, there is something extremely interesting in the way in which the beautifully wrought and carved rafters and side planks are brought, completely finished, to the ground, and put together like the parts of a child's puzzle. Although not very well adapted for winter residence in our cold and windy climate, the Swiss châlets make charming summer houses, and a person able to afford the cost of duties and transportation might give himself much pleasure, and excite a lively sensation among his friends, by importing one to use as a seashore or mountain cottage for the warm season.

THE *Sanitary Engineer* relates a story which surpasses anything we have yet heard as an illustration of the reckless folly shown by many people in regard to matters affecting their own health or that of their neighbors. It seems that a number of residents in one of the suburbs of Liverpool, in the neighborhood of one of the wells which are used to furnish the water-supply of that city, found, soon after the deep corporation well came into use, that their own private ones were drying up, and it finally became evident that the pumping from the deep well was draining all the shallower ones in the neighborhood. As they could not prevent the pumping, they were at last compelled either to take water from the corporation or go without it, and concluded to adopt the former alternative. After the service-pipes had been put in, having no more need of their wells, they were inspired with the economical idea of utilizing them for cesspools, and forthwith connected their drains with them, apparently without concerning themselves about the fact, which they had just had proved to them, that the contents of the wells, whatever they might be, flowed immediately into the corporation supply. Such people as this deserve to live in Newark or Jersey City, where they can enjoy the flavor of arsenic, petroleum and carbolic acid in their water, or in that Massachusetts village whose inhabitants, moved by a similar prudent economy, appropriated the old town cemetery as a school-house lot, and dug the cellar of the building where their children were to pass their days among the noisome relics of their ancestors.

AN interesting account is given in *Le Génie Civil* of the experiment made last month at the workshops maintained near Paris by the French Government for the study of military aërostation, in which a balloon about one hundred and sixty-five feet in length, carrying a weight amounting, with that of the balloon itself, to more than four thousand pounds, was steered for twenty-three minutes in various directions through the air, at a height of a thousand feet above the ground, and after a voyage of about four miles, much of which was traversed at the rate of twelve miles an hour, was steered back, and landed on the very pasture from which it set out. This is by far the most successful attempt ever made at aërial navigation; no balloon, however well furnished with propellers or wings, ever before having been able to return to its starting-place, although several have succeeded in deviating, by the action of their rudder and propeller, to a considerable distance from the direction in which the wind was carrying them. The new air-ship, which was constructed under the direction of M. Renard, captain of engineers, and director of the establishment, and his associate M. Krebs, captain of infantry; has very much the shape of a cigar, tapering toward each end, but having its thickest part very near the front. The car is also long and tapering, and is hung quite close to the underside of the balloon. The propeller, or two-bladed screw, works at the front end of the car, and the rudder is hung at the other end. The whole is balanced and based as well as possible, to prevent swinging or oscillation of the car. The motive power is derived from a secondary battery, acting upon a light electric motor, the weight of the battery and motor, independent of the propeller, being about eleven hundred pounds. Further trials are to be made, and the results are likely to be of great importance.

MANY of our readers have probably amused themselves with the "heliotrope," a semi-scientific toy, consisting mainly of a small, movable mirror, by which the sun's rays can be flashed with considerable precision toward a given point, so as to convey, by means of a suitable code of signals, messages between elevated points at considerable distances from each other. The same principle is now, according to the *Revue Industrielle*, to be applied to regular telegraphing between the islands of Mauritius and Reunion, in the Indian Ocean, east of Madagascar. The islands are one hundred and fifteen miles apart, but there are mountains of considerable height in Mauritius, and snow-capped peaks in Reunion, and between these it has been found possible to flash signals successfully. The population of the two islands amounts to something like four hundred thousand, and there are naturally many occasions for communication between them; but besides this, Mauritius is now, or soon will be, connected by cable with all parts of Europe and Asia, and the official heliotrope will serve to include Reunion in the system, without the expense of laying a cable between the two islands, so that preparations have been made for establishing signalling-stations immediately on the most elevated points, connected by land-telegraph lines with Port-Louis and Saint-Denis, the principal towns of each. Another incidental advantage of the sun-telegraph will be the opportunity given by it for transmitting intelligence from either island to the other of the approach of cyclones, which are common and very destructive there.

WE owe an apology to our readers for publishing, rather too hastily, a week ago, a letter from a certain plumber, signed "Justice," which, though written apparently in good faith, expressed an idea, in regard to the management of one of the best technical Journals in this country, which we know to be entirely unfounded. We do not like to amend or interfere with what our correspondents write, but ought in this case to have appended a distinct correction to the letter itself.

SANITARY PLUMBING.[1]—XXIX.

(f) The Plain Adjustable Flange-Joint.— General Considerations.

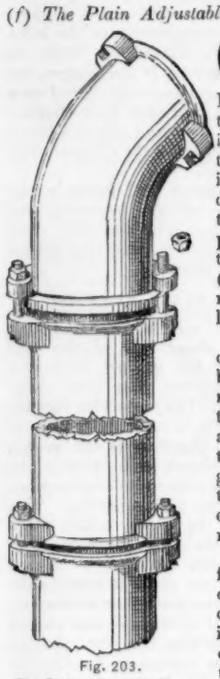


Fig. 203.
The Plain Adjustable Flange-Joint.

OF the various kinds of joints thus far reviewed, we have found the ordinary bell-and-spigot joint the most defective. It is faulty (1) in the manner in which the packing material is applied; and (2) in the position in which it is held; (3) in the absence of any provision for protecting it against the effects of strains in any direction, or of shocks or jars by which the spigot might be loosened from the packing in the socket; (4) in the temptation it presents for carelessness and fraud; (5) in the difficulty of disjointing it for repairs or alterations; and (6) in its costliness.

These defects are inherent in the nature of the joint. The calking may, it is true, be done by hydrostatic pressure or other mechanical means, and some of the difficulties involved by the customary laborious and unsatisfactory process be avoided, but the main defects remain. The use of grooves cast in the bell or spigot to hold the lead may, in a measure, alleviate the evil effect of strains or jars, but cannot remove it.

The sleeve-joint, is in principle, another form of bell-and-spigot joint. It has all the objections of the latter, and adds one of its own in that it doubles the number of calkings and packings required, and complicates the form. Its object appears to be the connection of wrought-iron pipes, upon which bells or caps cannot be formed in a single piece by casting.

The screw-joint is also particularly intended for wrought-iron pipe. It is a great improvement upon the foregoing two classes, removing the first four, but not the last two defects. For a system of cast-iron piping, however, it is not to be recommended.

The flange-joint is suitable for cast-iron, and removes many of the defects enumerated above. It has however, as we have so far illustrated it, the serious defect of being non-adjustable, which renders it for plumbing purposes, unsuitable. Moreover, as heretofore used, the flange-joint cannot be made tight under pressure, without considerable expense in fitting or planing the faces of the flanges, and the means employed for bringing the flanges together have been imperfect and unsatisfactory, requiring considerable working room, and rendering their use in contracted spaces inconvenient, or altogether impossible.

If these defects can be remedied, our ideal joint will have been obtained. Our problem is, therefore, to form a simple and inexpensive flange-joint, which shall be adjustable, tight under pressure, and easy to put together even in the most contracted spaces.

ADJUSTABLE JOINTS.

How shall the joint be made adjustable, without involving difficulties greater than the defect we are seeking to obviate?

We will assume that we have an upright pipe, to which a branch-pipe or bend is to be attached. The branch-pipe is put in to take the waste of some fixture, say a bath-tub, near the upright stack. In order to make the most direct connection with this fixture, and to avoid unnecessary bends or angles, and the cutting of joists, studs, or walls, the direction which the branch must take is subject to variation, and cannot be limited by the bolt holes in the flange of the pipe below. Hence all branch or bend pipes must have one of their flanges so constructed that the pipe can be turned on its axis before screwing up the joint. The natural way to accomplish this is to have a simple annular shoulder formed on the lower end of the branch-pipe, and construct the bolts with hook or hammer-heads as shown in Figure 204.

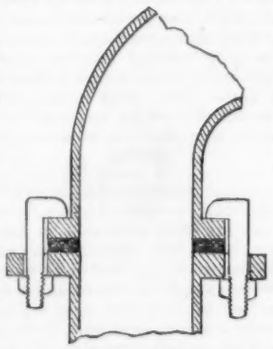


Fig. 204.
Adjustable Flange-Joints with Hook-Headed Bolts.

The upper pipe can now be turned on its axis, and the upper part made to incline in any desired direction before screwing up the bolts. Unfortunately we find two objections to this course. In the first place the pressure comes entirely on one side of the bolt tending to break off the head. All the strain comes on the few fibres nearest the flange. These are immediately ruptured, and the head then easily tears off.

In the second place, the bolt-head tends to slip off of the flange, and to revolve upon it, bending the body of the bolt, which reduces its strength, and gives it a most awkward and unsatisfactory appearance. The necessary draught given to the flanges of the pipe in horizontal casting increases the tendency of the bolt-head to slip off of its bearing.

In order to prevent the bolts from thus slipping off, it would be most natural to slip a ring of iron over the lower flange of the branch-pipe, and rest it on the flange ears of the pipe below, as shown in Figures 205, and 206. But this method would be expensive, and would fail to overcome the principal difficulty which arises from the form and bearing of the bolt-heads. What we want is such a bearing for the bolt-heads that the strain shall be equal all round.

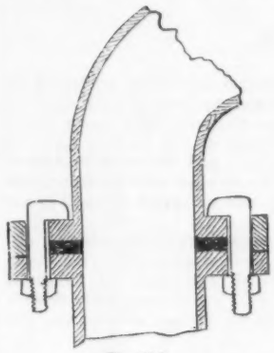


Fig. 205.
Adjustable Flange-Joint, with Ring to secure Bolts.

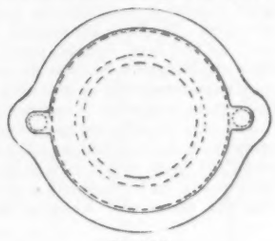


Fig. 206.
Plan of Joint, showing Ring and Bolt-Heads.

A ring bearing on the upper flange, and having ears corresponding with those on the flanges below, through which the bolts can pass cannot be used, advantageously, because it cannot be passed over the flanges of the pipe, unless both ring and flange be slotted, as shown in Figures 186 and 187. This not only weakens them seriously, but limits the amount of play or axial revolution on the part of the branch-pipe.

The difficulty may be overcome, however, by making use of half-rings, formed in the manner shown in Figure 207. The ends of the half-rings are halved together, and perforated for bolts at their junction. The bolts then serve to hold the rings together, while the rings in their turn furnish the required bearing for the bolts, and prevent their slipping away from the flange. Figure 208 shows in perspective the appearance of the joints thus formed. The half-rings must be made of wrought or malleable iron, in order that each shall take part in transferring to the flange the pressure applied by the bolts. They cannot be made of cast-iron, because in this case only one-half would take the entire strain, and the strength of the other be wasted.

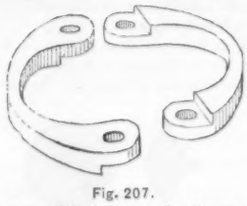


Fig. 207.
Half-Rings halved into each other at the points of Bolt-Heads.

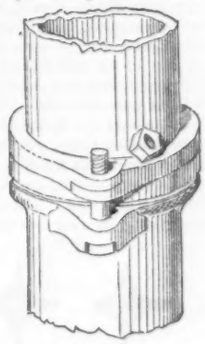


Fig. 208.
Joint with the two Half-Rings.

In order, however, to permit of the use of cast-iron, and yet ensure an equal distribution of the work, and avoid waste of metal, another step is required. A single half-ring of the form shown in Figure 209, is substituted for the double half-ring. This half-ring has a shoulder or projection on its under surface, just around the bolt-holes, as shown in Figure 210, for the purpose of bringing the whole pressure of the bolt directly upon the flange. All parts of the half-ring beyond these projections stand free of the flange. Hence any imperfection of casting, which, without them, might bring all the strain

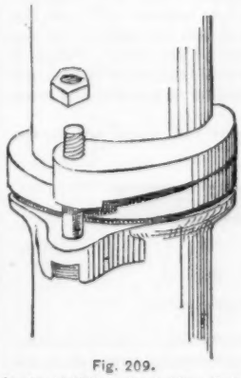


Fig. 209.
Single Half-Ring for holding Bolt.

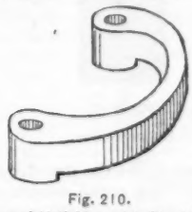


Fig. 210.
View of Half-Ring with Shoulders.

[1] Continued from page 88, No. 452.

to some middle point distant from the bolt-holes, and cause the ring to break under a leverage in tightening up the bolts, can with these projections do no harm, the whole of the bearing being transferred directly to the points where the strains come. In practice it is found that with this form of half-ring a comparatively light casting will bear an enormous strain.

The bolt-heads are prevented from turning, when the nuts are screwed up, by setting in recesses formed in the under side of the ears of the lower flange, as shown in the initial cut. Ordinary bolts and nuts may now be used, and the maximum of strength is thus obtained.

PACKING.

Having obtained a simple and practical method of rendering the pipe adjustable, we have next to find a cheap form of packing which shall render a roughly-cast joint permanently tight under heavy pressure. We have abandoned all forms of soft packing material, such as red lead, cement, putty, sulphur, and similar materials or their combinations, because we have found, after experimenting, that they were incapable of standing the various severe trials they are liable to be subjected to in practice.

The only packing we have found perfectly reliable under all circumstances is pure lead, and the only method of applying it so as to make the joint pressure-tight is to crush it between the flanges of the pipes to be jointed with a power sufficient to completely drive it into the pores and irregularities on the surface of the iron. In

Fig. 211.—Lead Packing-Ring.

order to enable this to be done economically, the lead must before use be cast into rings of a peculiar form of section. It is not necessary that there should be a very broad surface of contact between the two metals, but it is important that the surface of contact should be uniform and connected all around the pipe. A band of contact a quarter of an inch wide is found to be capable of resisting the highest hydraulic pressure which is ever likely to be applied in practice. With a pure lead ring of proper form, such a breadth of contact may be obtained on a four-inch pipe, by using two ordinary half-inch wrought-iron bolts. A man of medium strength can easily compress such a ring with a wrench fourteen inches long.

The form of ring necessary to produce this result is shown in Figures 211 and 212. The ring is, as we see in Figure 212, star-shaped in section. A ring having a double star-shaped section, as shown in

Fig. 212. Full-sized Section of Ring.

Fig. 213. Double Star-shaped Section.

Fig. 214. Diamond Section.

Fig. 215. Round Section.

Figure 213, would require nearly double the power for producing the same effect of calking, for the surfaces of the flanges, as they come from the foundry, are rough and full of indentations. Parts may come as much as an eighth of an inch above or below the general level. We will suppose a case of castings in which there are depressions an eighth of an inch deep in each flange, and that these defects happen to come opposite one another when the pipes are screwed up. Before the lead can come into contact with both the surfaces of these depressions, it is evident that the majority of the ring will have been compressed a quarter of an inch. Hence, a ring having a double star-shaped section would require twice as much strength as a ring of single star-shaped section to produce the same effect in calking.

A ring of diamond-shaped section, Figure 214, would act on the

Fig. 216. Square Section.

Fig. 217. Oblong Section.

same principle as the star-shaped ring, but would obviously be inferior to it. The round section would require many times as much power to compress as the star-shaped. The square and oblong sections would still further increase the difficulty and render the proper degree of compression practically impossible with rough pipes three and four inches in diameter.

Figures 218, 219, and 220, represent our joint with the star-shaped packing-ring in position, before being crushed under the compression of the bolts. Slots instead of holes are here used in the flanges, but holes are to be preferred since they are cast with chaplets and therefore afford a better bearing for the nuts and bolt-heads.

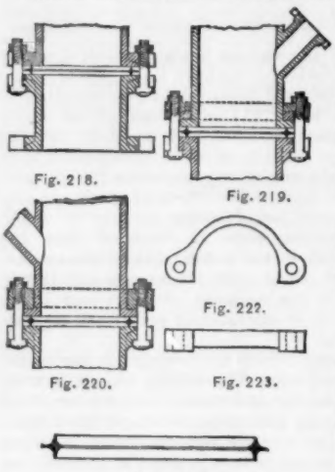


Fig. 218. Fig. 219. Fig. 220. Fig. 222. Fig. 223.

Fig. 221.

Figure 221 shows a section of the lead-ring, and Figures 222, and 223, show the cast-iron half-ring in plan and section.

FLUSH FLANGES.

It will be observed that the outer side of the lead ring has greater horizontal projection than the inner side. The projection extends nearly to the outer edge of the pipe-flanges all round. Its object is to enable the workman to satisfy himself that the ring stands in its proper place on the flange, by feeling it all around before tightening up. This enables us to dispense with a spigot on the pipes, which could have no other object than to serve as a guide. By dispensing with a spigot, and using plain flanges with flush surfaces, we obtain three very important advantages. In the first place it enables the pipes to be disjointed at any time without perpendicular movement, by simply unscrewing the bolts on each section of pipes and sliding out the section to be removed without disturbing the rest. In the second place it leaves more surface on the flanges to receive the packing-ring, and renders the joint correspondingly more compact.

In the third place it is simpler. The spigot is not needed for guiding the pipe-ends to their places, because the outer edges of all the flanges are of equal circumference, and can therefore best be adjusted from without, and adjusted much more accurately than could be done by a spigot, which requires considerable lateral play in its socket, to compensate for the necessary imperfection of casting and ensure its entering the socket at all.

METHOD OF BOLTING THE JOINT.

For ordinary steam-fitting the flanges are pierced with several holes and a corresponding number of bolts are used, the nuts on each bolt being screwed home successively, the pipe being held in place against the pressure of the wrenches by some external power or by its own weight.

This method has several disadvantages of especial weight in plumbing work. In the first place, the bolts which come in the rear of a pipe standing against a wall or ceiling are out of the reach of the workman, and in the second place the external power necessary to resist the pressure of the wrenches cannot always conveniently be applied, and its application must always increase the expense of making the joint.

To avoid these difficulties, the flanges should be made with only two bolt-holes directly opposite each other, and the bolts should be of such a size and strength that only two are needed to do the work of compressing the packing. We have found, upon careful experiment, that two half-inch bolts of wrought-iron possessed ample strength for compressing rings of pure lead, star-shaped in section, on pipes of four inches or less in diameter.

In order to avoid the necessity of securing the pipe while the nuts are being screwed up, we have threaded the bolts in opposite directions, using on each joint one right-hand and one left-hand threaded bolt. This enables us to use two wrenches at once, and the pressure exerted by one is resisted by the other. The objection is thus turned to a positive advantage, inasmuch as the amount of pressure which has to be resisted becomes an exact index of the degree of compression exerted on each half of the lead packing. In other words, it causes both sides to be compressed alike, for, as the nuts are turned, that which has received and given the greatest pressure ceases temporarily to turn until the other has caught up to it.

FORM OF WRENCHES.

One of the greatest difficulties attending ordinary hand calking is occasioned by want of space for manipulating the calking-tool. The pipes are often set in slots or corners, or between joists, or in positions such that thorough calking is impossible. With a properly constructed flange-joint and properly formed wrenches, this difficulty can be entirely overcome, and a 4-inch pipe-joint made tight, even at the bottom or back of a slot a foot deep, and no more than one brick, or eight inches, in width. With the usual form of wrench this cannot be done, though even then the joint can be made tight in any place in which the ordinary bell-and-spigot joint can be calked. A special wrench has therefore been devised for this joint, by the use of which it can be firmly screwed together, though set in the most awkward places, in less than a minute's time. Figures 224 and 225 show the wrench used. It is a ratchet-wrench of simple construction and great

strength, made to fit the special-sized nut used in this joint. The head is made very small, in order to enable it to pass over the nut without touching the side of the pipe. The handle is bent as shown

Fig. 224. — Plan of the "Sanitas" Wrench.

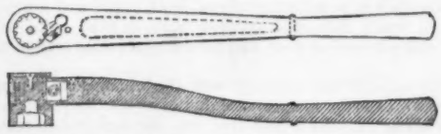


Fig. 225.—Section of the "Sanitas" Wrench.

in Figure 225, and is made detachable from the turning gear, so that each wrench may be used for a right or a left handed bolt, by adjusting the handle accordingly. The bend in the handle enables the hands to pass by each other in screwing up the joint. The whole is made of steel and malleable iron. With such an arrangement the nuts may be screwed home without once taking off the wrenches. This evidently saves a vast amount of time and annoyance, and enables the work to be done in the most contracted spaces. Thus, taking for example an extreme case, as shown in Figure 226, the pipe stands at the back of a slot a foot deep and eight inches wide. The wrenches may be moved through the arc indicated by the dotted lines, a movement which is considerably in excess of what is necessary to do the work.

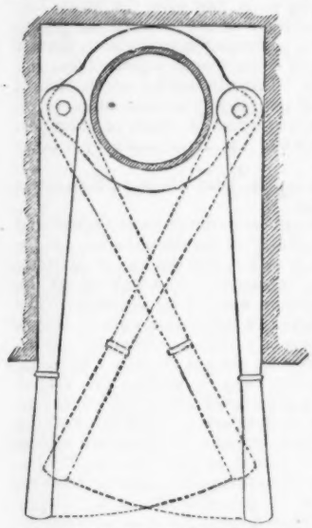


Fig. 226.—Forming a Joint in a Deep Slot.

SAVING IN TIME.

In this manner our joint may be thoroughly calked by a single ordinary workman, after the pipes are once in place, in *less than twenty seconds*. To calk an ordinary bell-and-spigot joint in the usual defective manner is estimated by good authorities as requiring on the average, after the pipes are once in place, *as many minutes*. A very skilful workman, with his helper, could pack the oakum, pour and thoroughly calk the lead in much less time, say five minutes, by making a special effort. But even this is fifteen times as long as is required for calking our improved joint. If we count the time of the helper (considered indispensable by the ordinary hand calker, for melting and transporting the lead, but not required for our flanged pipes), the bell-and-spigot joint takes thirty times as long to calk as the improved flange-joint.

SAVING IN MATERIAL.

In the ordinary four-inch bell-and-spigot joint nearly two inches of the end of each pipe, namely, the spigot-end, is sunk into the bell and wasted. In other words, the pipe is uselessly doubled at this point. The metal in this two inches offsets that in one of the flanges in our flange-joint. The enlarged bell and its strengthening beads offsets the other. The amount of iron in the two joints is equal, or in favor of the flange-joint; in every other respect the flange-joint shows a great saving of material. The quantity of lead used is about one-eighth. Thus, for a four-inch pipe our packing-ring weighs less than a half a pound, and there is no waste. In the same sized bell-and-spigot joint, properly made, four pounds are consumed, as already stated, the rule being a pound for each inch in the diameter of the pipe; for our flange-joint the rule is *one-eighth* of a pound for each inch, though less would probably in most cases suffice. With lead at four cents a pound, this is equivalent to a saving of fourteen cents on every four-inch joint used, and seven cents on every two-inch joint. Another saving in material is in the jute or oakum, which is not required in the flange-joint; the saving in this item amounts to at least two cents for four-inch joints, and one cent for two-inch joints. A third saving is in the fuel for melting the lead. A pound of lead requires on the average, for melting, a half of a pound of charcoal as burned in a plumber's stove; hence two pounds of charcoal is required for every four-inch joint, and, allowing for the cost of charcoal one cent a pound, we have a saving of over two cents a joint in fuel.

VARIETY OF FITTINGS.

In bell-and-spigot pipes comparatively few bends and branches are made. Should the angle required to reach a certain fixture in laying the pipe be a different one from that given by the bends furnished, the desired direction must be obtained by canting the spigot slightly in the socket, a movement different from the axial rotation we have already described and provided for. To accomplish the same result with flanged pipes, a greater variety of castings are made, furnishing bends of a larger number of angles, in the same manner as is done in wrought-iron piping when used with screw-joints for plumbing purposes. With the flange-joint a certain play is obtained by screwing-up that side of the pipe upon which the greatest inclination is to be given slightly more than the other. But the variety of castings furnished enables every requirement to be met, without resorting to the method of unequally compressing the packing-ring. We find $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, $\frac{1}{32}$ and $\frac{1}{64}$ bends, corresponding to angles of 90°, 60°, 45°, 22½°, 11¼° and 5⅝° respectively. By using some one of these bends, or a combination of two or more, any desired direction can be obtained. The half-rings are required only for bends and branches. Straight pipes are screwed together directly, and have ears and bolt-holes at both ends.

METHOD OF CONNECTING WITH LEAD PIPES.

With ordinary bell-and-spigot pipes, the proper connection between lead and iron is both laborious and expensive, requiring the use of brass ferrules. The lead pipe has to be wiped onto the brass ferrule, and the brass must be calked into the iron hub. A double joint is thus required, and this, especially with the larger pipes, involves the use of considerable skill and valuable material. With our flanged joint all of this is done away with. The lead is simply flanged out to correspond with the flanges of the iron pipe to which it is to be connected, and bolted to the pipe by means of a cast-iron ring furnished with the pipe-fittings, and having ears and bolt-holes corresponding with those of the pipe-flanges, as is shown in section in Figure 228, and in perspective in Figure 227. The lead packing-ring is used between the lead and iron flanges exactly as if the flanges were both of iron. In this manner a permanent steam-tight joint is formed between the two metals without hand-calking, brass ferrule or joint-wiping.

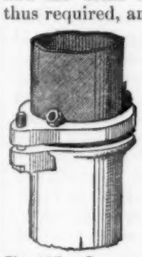


Fig. 227.—Perspective View of Lead Connection with Flanged Pipe.

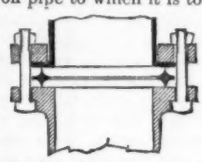


Fig. 228.—Section of Lead Connection with Flanged Pipe.

APPLICATION OF THE HYDRAULIC TEST.

As already explained, the hydraulic test, which should in every house be required before the work can be pronounced safe, is on ordinary bell-and-spigot pipes very difficult of application, because there is no method of temporarily closing the outlets. Here, again, our flanged joint presents an advantage of great importance. In order to close the opening, it is only necessary to screw on caps provided with ears and bolt-holes corresponding with those of the pipe-flanges, as shown in Figure 229. The regular packing-ring is used between the cap and flange, so that the joint is steam-tight, like the rest of the piping. When the test has been made, the caps can be removed and used again and again by the plumber. They are furnished with the rest of the pipe and fittings. The lead rings, after use, can be used for old lead or recast into new rings.

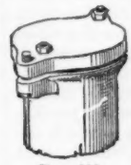


Fig. 229.

TESTING THE PIPES AND FITTINGS AT THE FOUNDRY.

It is sometimes required in practice that each pipe used be tested at the foundry before coating them, in order to ensure soundness. With ordinary bell-and-spigot pipes, the application of a pressure test is difficult, if not impossible. The straight lengths can be tested under pressure, but the branches and bends offer serious difficulties on account of their form. Hence the oil test has to be resorted to, and the strength or thickness of the pipe is not by this method made known; moreover, the oil test is in many other respects obviously inferior to a strong pressure test. A simple machine has been devised to test these flange pipes. It consists of two plates with rubber disks on one side, which are pressed against the flanges of the pipe to be tested, by means of clamps and wedges of peculiar form, designed for rapid application. One of the plates is perforated and connected with a water-pipe and pressure-guage. A simple force-pump is added, so that where the water-pressure is subject to considerable fluctuation, each pipe may be tested under precisely the same pressure. By the use of this device, flanged pipes of any desired size, and all the branches and fittings, may be quickly and accurately tested at the foundry before coating.

EVEN THICKNESS OF THE PIPES.

In the case of ordinary bell-and-spigot pipes, the expense and imperfections of the jointing are so great that the pipes are cast very long, in order to save joints so far as possible. The attempt to cast pipes of small diameter, say two-inch, three-inch and four-inch, in lengths of five feet, is almost certain to result in an inequality in the thickness of the metal. The writer has found bell-and-spigot pipes of five-foot lengths, made by the best firms and sold for extra heavy weight, no thicker than a piece of thick paper on one side and half an inch on the other. Figure 230 is an accurate drawing of a two-inch pipe which he has recently been obliged to reject, among a large number of others from the best makers, upon testing them before they were laid by the plumber. It is much more unusual to find pipes of equal than of unequal thickness throughout. This is a very

Fig. 230.—Section of a Defective Bell-and-Spigot Pipe.

important consideration. The strength and thickness of a line of piping is equal to its thinnest part, as the strength of a rope is equal to its weakest part. Hence all the metal used in the piping of a house beyond the thickness of its thinnest part is thrown away. Of what use is it to pay for extra heavy pipes, when one side of most of them is *extra light?* It is not for the strength of the piping that we require the thickness, since they are not used like columns to support floors and walls, but for security against leakage and decay. Now since, as is very well known by plumbers and engineers, the majority of long pipes of small sizes are uneven in thickness, the chances of obtaining only the even pipes throughout an *entire stack* are obviously infinitesimally small, and it is not probable that one house in a thousand exists in which one or more of the lengths of pipe are not very seriously uneven. The enormous waste of metal and the great danger of leakage which this condition of things implies renders it of the utmost importance to employ some means of remedying this great defect.

We find a remedy in diminishing the length of our castings. For house-plumbing purposes, pipes (especially the smaller sizes) should never exceed three feet in length. The plumber would find great advantages to offset the inconveniences in using a variety of short lengths of pipes, instead of frequently cutting the usual five-foot lengths to fit the spaces between the floors and fixtures. Cutting cast-iron is an extremely difficult and tedious process. Were these various lengths manufactured from six inches up to three feet, he would find it possible to avoid cutting entirely, and probably add very few joints to the number now required. For it must be borne in mind that each time a pipe is cut a new joint is necessitated, so that the saving in the number of joints in ordinary plumbing practice, by using no other than five-foot castings, is much smaller than is at first supposed. Now, however, that we have found a simple, safe and economical joint to take the place of the clumsy, uncertain and expensive one in vogue, we have no further need of long castings. The saving in pipe-cutting, to say nothing of the other advantages, far more than offsets the labor of making an extra joint or two, and we have a stack of pipes whose thickness can be relied upon as being uniform throughout. The pipes and fittings used with our flange-joint average less than two feet in length, and never exceed three feet. No pipe-cutting is in any case required.

DISJOINTING FOR REPAIRS, ADDITIONS OR ALTERATIONS.

Where it is found necessary for any purpose to remove a piece of pipe from a stack already set up, it is only necessary to place temporary supports under the pipe above the one to be disjointed, unscrew the bolts, remove one of the lead rings by means of a chisel or saw, and slip out the length to be removed.

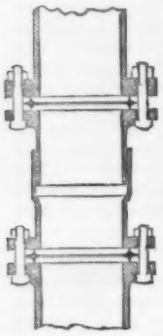


Fig. 231 — Insertion of a Fitting with Flanged Brass-Pipe.

To replace a pipe or fitting several methods may be employed of which the best is that in which short flanged or threaded brass-pipes are used. To the lower end of the pipe to which the new piece is to be connected is bolted a short piece of flanged brass-pipe, as shown in Figure 231. Another short flanged brass-pipe is then slipped over the first, being made just large enough to do so, and the fitting to be connected is afterwards bolted to its flange, and to the main piping below as shown. The two brass-pipes are finally connected by means of an ordinary wiped solder-joint, or brass-pipes may be screwed to iron flanges as shown in Figure 232, to save the more expensive metal.

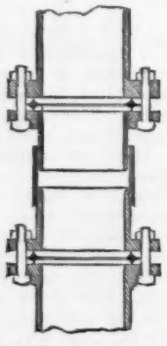


Fig. 232. — Insertion of a Fitting with Threaded Brass-Pipe.

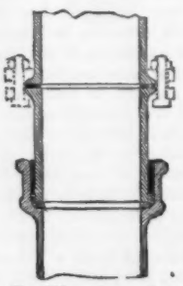


Fig. 233. — Connecting Flange Pipes with Bell-and Spigot Pipes.

Another method is to substitute iron for the brass pieces, and calk the joints by hand in the usual manner, Figure 233. This latter method however, has the objections of all calked joints, and is for this reason not to be recommended when the first can be applied. By this means the flanged pipes may be connected with old work in which bell-and-spigot pipes have been used. Or bell-and-spigot pipes may at any place be inserted in the line of flanged pipes in this manner if desired.

POWER TO RESIST STEAM-PRESSURE AND SUDDEN ALTERNATIONS OF HEAT AND COLD.

As we have already explained the bell-and-spigot joint is incapable of withstanding the effects of sudden and severe variations of temperature. The spigot being nearest the heat expands more than the hub, and compresses the surrounding lead, permanently diminishing its bulk, and forming a passage for the escape of gas. The principle of the construction of our flange-joint is such that this trouble is overcome. The flanges are affected equally by changes of temperature, and the lead packing is never compressed by expansion or contraction. Thus supposing, Figure 232, when the pipes are cool, steam is suddenly allowed to pass through them. Both upper and lower flanges and the lead firmly imbedded between them expand alike outwards under the same degree of heat, and return again unaltered as the pipe re-cools.

The bolts expand and contract with the changes of temperature proportionally with the flanges, and do not affect the packing.

To give these theories a practical test, the writer had some four-inch piping connected and closed up at the ends with our flanged joints, and coupled the whole with the boiler of a steam-engine, the steam-guage indicating about thirty pounds pressure. The steam was left on until the pipe-flanges and bolts had all become thoroughly heated through. The coupling was then immediately transferred to the cold water supply from the city main, and after the steam had been let out the cold water was suddenly turned on until the piping was filled. As the experiment was performed in mid-winter, the test was as severe as possible. The cold water was then poured out, and steam again immediately applied. This alternating application of steam and cold water was repeated successively a dozen times. During the entire process no sign of a leak either of steam or water was obtained. The bolts had been screwed up in the ordinary manner without extra care.

It is well known that no bell-and-spigot joint will stand such a test even after the most careful calking.

The same variations of temperature cause the pipes to expand and contract also longitudinally. But in this direction there is always ample play left in setting the pipes for this action, and the lead is obviously not affected by it. Each packing has upon it the weight of all the pipes above it, as well as the pressure exerted by the bolts. The weight is therefore constant, whatever be the temperature or length of the pipes, provided they are properly set. The expansive force of iron is so great that if free play is not allowed for it in a building, it will make way for itself by tearing away its bonds. Mr. Bayles says: "In setting up a line of soil-pipe, intelligent provision should always be made for expansion and contraction of the metal resulting from changes of temperature. These changes, however, are seldom sudden or extreme; but when the pipe is at any point rigidly fastened to the wall it expands in both directions. The amount of motion at the ends is small, but it must be provided for, or it will provide for itself. The power with which iron expands, as its temperature is raised, is practically irresistible. The end of a pipe may not move more than an eighth or sixteenth of an inch, but the power with which it moves that distance is so great that it can only be resisted by a power great enough to crush the metal. This would be, in ordinary cases equal to about 75,000 pounds per square inch, the strength of cast-iron to resist crushing strains, being from 60,000 to 90,000 pounds per square inch. Consequently, we see that unless the fastenings at the ends of a line of cast-iron pipe are of such a character as to admit of slight movement, something must give way, and it is not likely to be the pipe. This, then, must be provided for in the character and position of the fastenings, which must be so arranged that while allowing for some movement, they shall not develop a tendency to break or loosen the joints. Under ordinary conditions the amount of expansion is seldom great enough to give much trouble, but when steam or a great volume of very hot water washes into an iron-pipe, it is sometimes great enough to loosen joints, and even crack the pipe."

Accordingly if a line of pipe is rigidly fixed at the bottom, the hooks which hold it against the walls should be placed a short distance away from the flanges, so that the line of piping is free to slip up and down slightly under the influence of expansion and contraction. Otherwise these hooks are liable to be loosened from the mortar or woodwork into which they may be driven, since it would be easier for the pipe to loosen the hooks in the mortar or wood than to further compress the packing-rings, or to stretch out the heavy bolts of wrought-iron.

SECURITY AGAINST CARELESSNESS AND FRAUD.

The opportunities furnished by the ordinary bell-and-spigot joint for careless or fraudulent work are avoided in our flanged joints. The entire thickness of the lead is visible from the outside between the flanges. As the lead is the only packing used, and as this is in open view nothing can be fraudulently omitted. The bolts and nuts are also visible and, moreover, must be of the standard size and strength in order to furnish the requisite amount of compression to stand the hydraulic test.

IDEAL JOINT REALIZED.

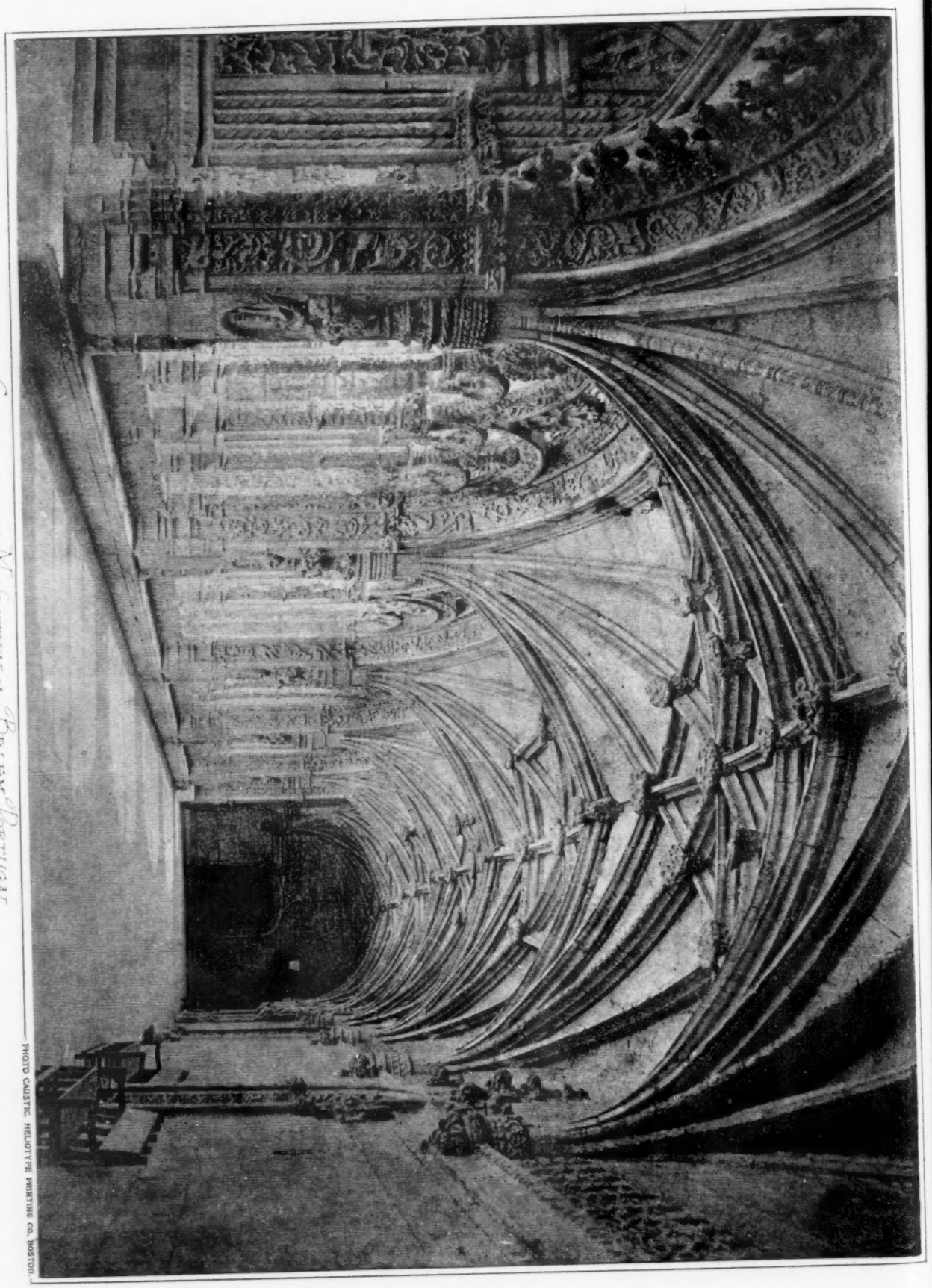
Thus if we turn to our table of requirement for an ideal joint, we shall find in our adjustable flanged joint all the characteristics there demanded.

(1) It is water, gas and steam tight even under heavy pressure.

(2) It is unaffected by the expansion and contraction of the pipes.

(3) It is capable of resisting severe jars and strains both compressive and tensile, such as are occasioned by the weight of the pipe, or by settlement and movement in the building.

(4) It requires neither skilled labor nor machinery in its manufacture or in its jointing.



CLOISTER OF THE MONASTERY AT BELEM, PORTUGAL.

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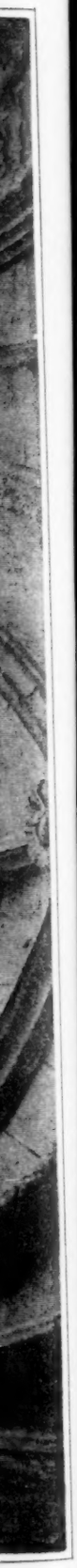

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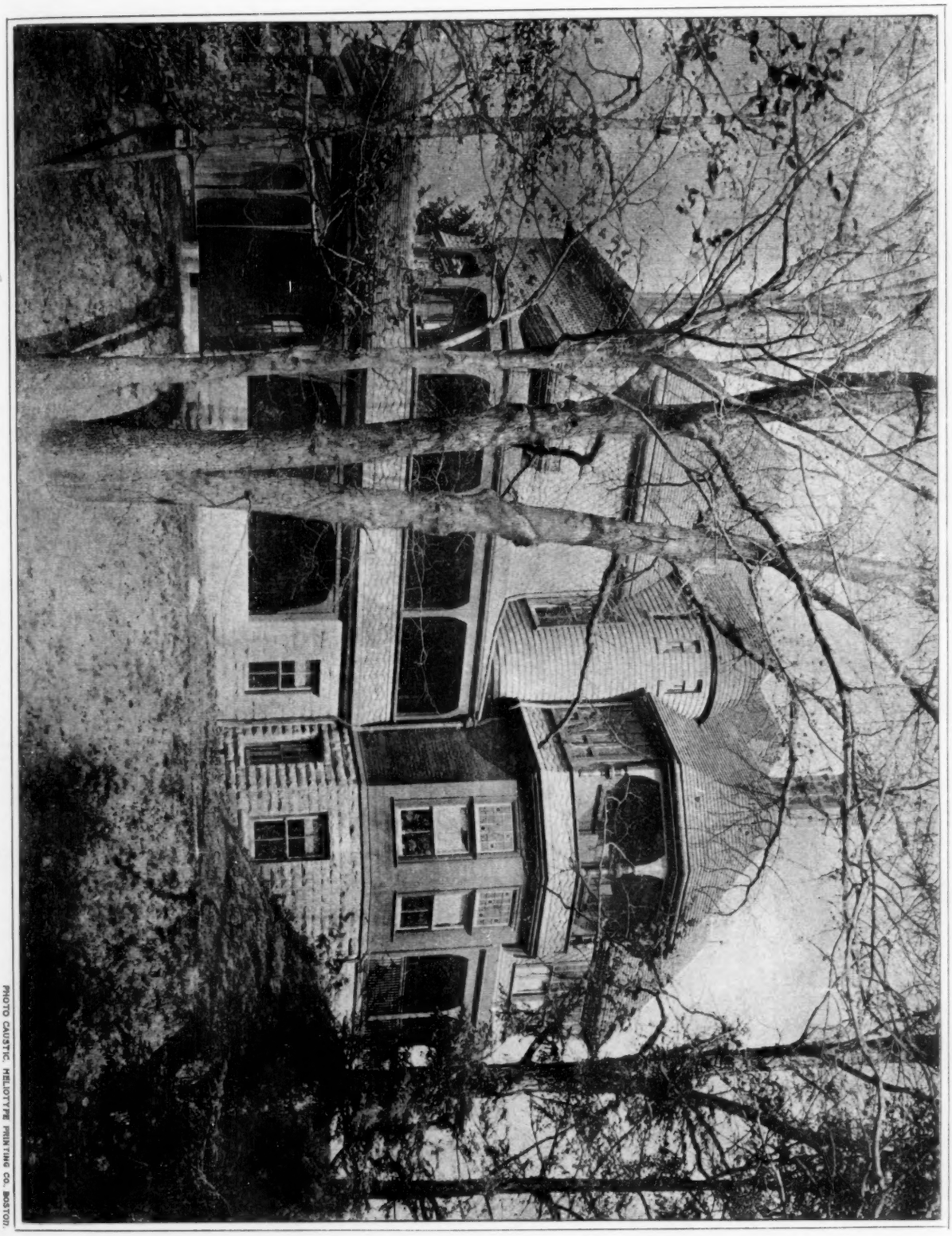

House of J. A. Arpon, Cleveland, O. J. A. Schweinfurth, Arch't.

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STORE ALBANY N.Y. for JOHN C. MYERS Esq.

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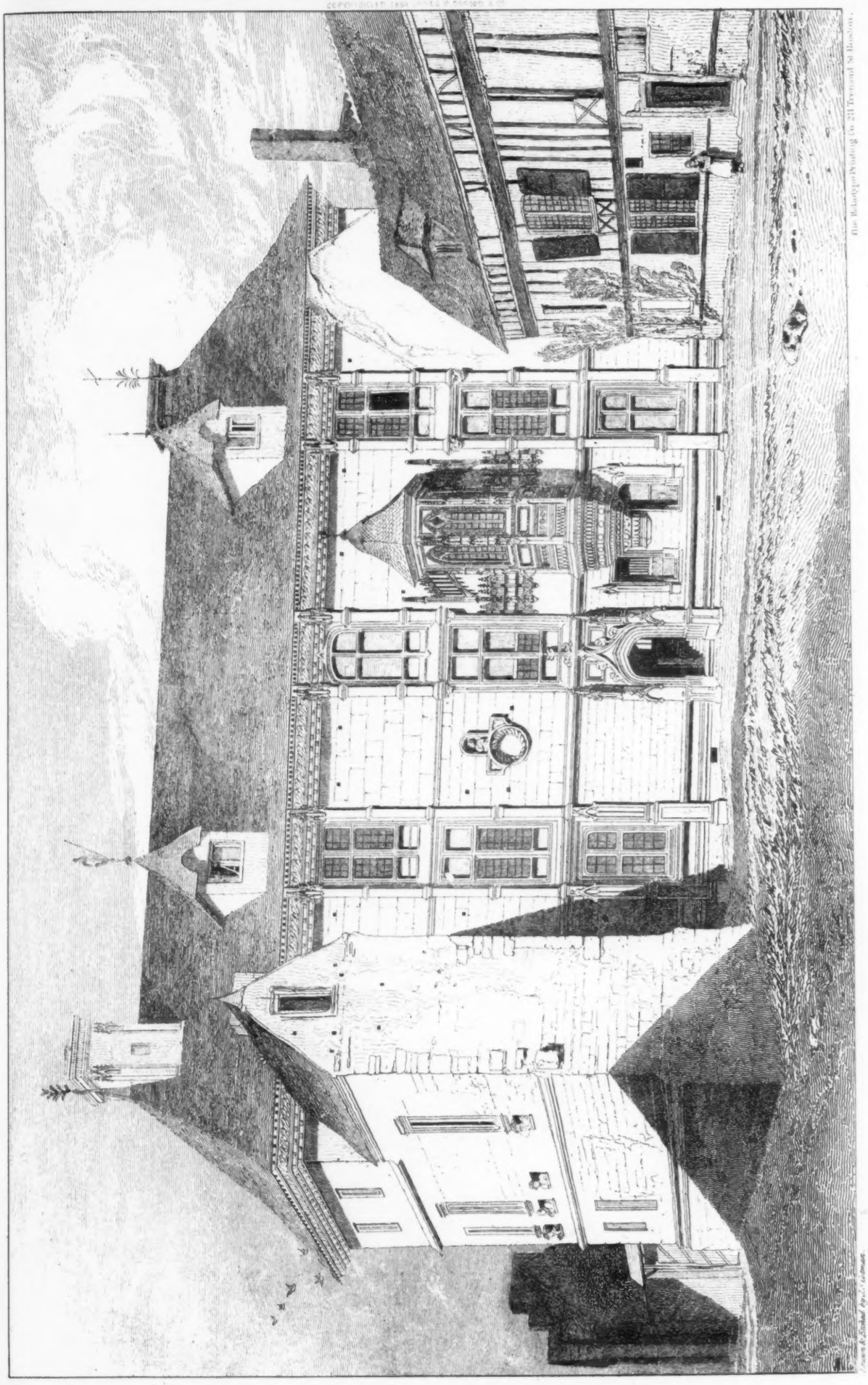


GREAT HOUSE.

at Grand Lodge.

(5) It is of such a form and nature as to admit of its being as easily taken apart for repairs or alterations as it is put together, and this without damage to any part.

(6) Its form and construction is such as to allow it to be made and put together rapidly, to follow easily the irregular contour of the construction, and to be used immediately after fixing in place.

(7) It requires no hand calking or hammering, which are liable to fracture the pipe or its lining.

(8) It is so formed that any imperfection, either in the materials used or in the manner of putting them together can be easily detected at a glance from without, without expert aid.

(9) It is compact enough to permit of its use in the most contracted spaces.

(10) It causes no obstruction to the water-way, and leaves no appreciable space or pocket for deposit.

(11) It is simple, durable, indestructible, economical and un-objectionable in appearance.

It is therefore suitable for water, gas and steam under pressure as well as for drain and soil pipes.

The writer has put these pipes to practical test in house-plumbing with complete success in every particular, as will be fully described in another chapter.

ART IN CHALDEA AND ASSYRIA. — 7.[1]

THE first instalment of the great work of Messrs. Perrot and Chipiez on ancient art, dealt with the art of Egypt up to the time when foreign influences materially altered its character, and has already been reviewed in these columns. The second instalment is now before us, and tells the tale of Chaldean and Assyrian developments. Like its predecessor it has been translated into English by Mr. Walter Armstrong, and fills two large octavo volumes, profusely illustrated with wood-cuts, and with steel and colored plates.

Judging these volumes on their own merits only, we find no lack of interest or instruction; but comparing them with those that spoke of Egypt, we are compelled to call them a degree less fascinating. The difference results, not from any deficiency on the author's part, but from the nature of the subject itself. Just because the products of these two different civilizations are described and discussed with equal fulness and clearness, and the same sympathetic insight, do we feel justified in pronouncing the art of Egypt more attractive to the artist than that of Mesopotamia. Historically, it is true, the matter stands otherwise. The influence of Mesopotamia upon Europe was stronger and more direct than that of Egypt; Greece, which must always be the centre of attraction to those who study ancient art, learned far more from its Asiatic than from its African predecessors. But intrinsically the relics of the latter claim a larger share of our sympathy and admiration; and the reason is two-fold. Taken as a whole, the artistic results of Egypt are finer than those of Chaldea and Assyria, and they are also much more varied among themselves. The charge of monotony once brought against Egyptian art has been disproved by fuller knowledge. But it seems improbable — indeed, I may fairly say impossible — that further discovery will ever disprove the similar charge we may bring to-day against the art of Mesopotamia. In both countries, of course, many sites still remain untouched, and it would be rash to predict that our ideas and conclusions may not be modified to some degree by what they may reveal; but our present information is nevertheless sufficiently ample to justify us in saying that in the valleys of the Tigris and Euphrates, ancient civilization and the art it fostered were less rich in possibilities of variety as well as in possibilities of charm, than the ancient civilization and the art of the valley of the Nile. As time passed changes went on in the one land as in the other, and as in all lands that have ever been. Immutability is not possible in anything wrought by men; not even though those men be Asiatics. But the art of western Asia changed less rapidly than even the art of Egypt, and changed in less conspicuous ways. And it also covered a less wide and varied field at any given period of its development.

We may find a proof of its comparative immutability in the arrangement of these volumes. In writing the artistic history of an empire which lasted many centuries and the seat of which was more than once transferred from south to north, and then from north to south again, our authors have not found it wise to attempt to follow any chronological scheme. They have felt themselves justified in treating the different branches of Assyrio-Babylonish art each at first as a whole, noting afterwards those variations which came through lapse of time and change of place. They found no such radical diversities as compelled them in their work on Egypt to describe first the art of the ancient empire, and then the art of later generations. In other respects the two books are similar in arrangement, and the second is as clear and logical as the first. We begin with a masterly *résumé* of the characteristics of local civilization, which is followed by a description of the characteristics of its architecture in general. Then come chapters on funerary, religious, civil, and military building, and then those that deal with sculpture, painting, and the industrial arts, while a comparison between Egypt and Chaldea closes the work. As was the case with its predecessor, the illustrations often reveal unfamiliar objects, and always are chosen with a keen eye to their strictly illustrative, explanatory qualities.

It is not very long since the accepted history of the Mesopotamian empires was a mere issue of legends and fables, the most trustworthy items of which were the scattered and unscientific references found in books of the Old Testament; but since the discoveries of Layard and the deciphering of the cuneiform records, our knowledge has been placed on a firmer basis. The history of the people who dwelt in the valleys of the Tigris and Euphrates is now known to us, not indeed in a fulness at all approaching to detail, but at least in its general divisions and main outlines. In the earliest days of which we have any knowledge we see east of the Tigris in its southern course a country which the Greeks called Susiana and the Jews Elam. West of the Tigris in southern Mesopotamia, the first Chaldean Empire is arising. The two countries were perpetually at war, and the earliest date that can be fixed marks the Susian conquest of Chaldea, in B.C., 2295. But the balance of power was soon reversed. Susiana became subject to Chaldea, and is of little interest to the student of art for its few existent relics show it to have been, artistically speaking, a mere offshoot of the western kingdom. This First Chaldean Empire had its earliest capital at Ur (now Mugheir) near the ancient mouth of the Euphrates. The date of one of its kings, Ismi-Dagan, has been fixed at about B.C., 1800, and at this time it was probably at the height of its power, embracing under its dominion the whole of Mesopotamia. About two centuries later (B.C., 1600), occurred the Egyptian conquest under Thotmes and Rameses. While their deputies ruled the land the various tribes of Upper Mesopotamia revolted, and after a period of petty sovereignties coalesced into a united Assyria, with Nineveh as its capital. This new empire in its turn gradually absorbed the whole of Mesopotamia. By the end of the fourteenth century the Egyptians had retired, and though Chaldea still had her own kings (now seated at Babylon) they were but vassals of the Assyrian monarch. Constant attempts were made to throw off his yoke, and for about fifty years — between 1060 and 1020 B.C., — Babylon seems to have held the sceptre. This was the end of what is known as the First Assyrian Empire; but a new family soon mounted the northern throne, and after severe conflicts succeeded in founding the Second Assyrian Empire. To it belong those great monarchs whose names are familiar to modern ears, who extended the borders of their empire to the Mediterranean, and who built the vast monuments, from the ruins of which we have gathered almost everything we know of themselves and of the land they ruled. But their empire, so wide in extent, was not consolidated; the countries they subdued were never amalgamated with Assyria, were hardly annexed thereto in the true sense of the word. Revolts were of yearly occurrence, and a consequence of the unceasing wars they necessitated was the gradual destruction of the governing and fighting classes in Assyria herself. The empire was already almost in a state of disintegration when the Scythians fell upon it about the year 632; they are said to have left it with but half its population surviving, and the way was thus prepared for its eventual conquerors — the Medes — who appear to have been assisted by rebellious Babylon. Nineveh was wiped out, and the Assyrian land was possessed by the Medes, while in the southern half of Mesopotamia arose the Second Chaldean Empire, having its capital at Babylon. Nebuchadnezzar is the most conspicuous figure of the time. Almost everything we now find on the site of Babylon bears traces of his hand, and at his death it was the largest and finest city in Asia. But the Persian monarchy was arising in the east, and after it had conquered and absorbed the Medes, Babylon, too, fell before the arms of Cyrus. With its fall (B.C., 536), ends the period with which Messrs. Perrot and Chipiez have concerned themselves. I have retraced these historical outlines, because unless they are borne in mind we can get no clear idea of the progress of art in Mesopotamia. Dates are few and description can but refer to the different empires which succeeded each other as the centuries passed. I must however, refrain from summarizing the authors' interesting analysis of local civilization and pass at once to the art in which it found expression.

The controlling influence of geography upon architecture could not be more forcibly shown than by the contrast Chaldean work presents to other ancient styles. Egypt was bordered by mountains of soft stone, and Greece was rich in quarries of marble, and each country developed a Lithic style that accorded with and clearly explained the qualities of its native material: but the Chaldeans dwelt on a vast level plain, much of it a deltic formation, where stone was the rarest of commodities. So, here we find an architecture in which clay, crude or burnt, or enamelled brick, is the sole material. Indeed, we may almost say, as will be shown farther on, that Mesopotamian builders heaped masses of earth together to form their works, instead of employing separate units of construction; but we find also that custom and tradition may be factors almost as potent in architecture as geographical conditions. The Assyrians received their art from Chaldea, and they clung to Chaldean ideals, and persisted in Chaldean habits, although their opportunities were very different. Stone lay in unlimited qualities within easy reach of Nineveh, but its buildings, too, have clay as their chief, almost as their sole, material. The main fabric of their huge palaces, temples, and observatories was of brick. They

[1] *A History of Art in Chaldea and Assyria*, from the French of Georges Perrot and Charles Chipiez. Illustrated, translated, and edited by Walter Armstrong, B.A. London: Chapman & Hall, New York: A. C. Armstrong & Son, 1884.

merely revetted some of their exterior walls with stone, employed it inside their apartments for paving, and for lining the lower parts of the walls, and used a columnar style occasionally in small and subordinate structures. Wood, too, was denied the early Chaldean; and so when the Assyrian found it within his reach, and when the vast commerce of Babylon might have brought it to the hand of the Chaldean of the Second Empire, it was still employed only for such accessory things as ceilings and doors. Metal, easier of transportation than either wood or stone, was used in profusion by the Chaldean decorator and by his later imitators.

In Chaldean as in Egyptian brick-making, the clay was always mixed with chopped straw. The moulds in which it was cast measured about fifteen-and-a-half inches square, and in thickness varied from two to four inches. For general use they were burned only in the scorching southern sun. In Assyria these crude bricks were used while damp, so that units and courses adhered, and the resultant mass scarcely differed from *pisé*. It was revetted with slabs of alabaster or limestone, or covered in its upper portions with a coating of stucco. Comparatively minor use was here made of burned bricks; but in Chaldea excellent burned bricks, a little more than a foot square were alone used for the outer covering of the crude brick core, and the crude bricks themselves seem to have been put in place when more thoroughly dry, as they preserve their individuality to the eye, and sometimes to the touch. Neither in Chaldea, nor in Assyria are the lofty foundation mounds, upon which all important structures were erected, always composed of brick. Sometimes there is merely a brick shell filled in with earth and the débris of earlier constructions. In Assyria, mortar was not used, clay, mixed with water and a little straw being the only cement. This we sometimes find to be the case in Chaldea too, but at other times mortar made of lime, or of lime and ashes, or of bitumen was employed. In Assyria, bitumen seems only to have been employed in the formation of pavements. Mighty buttresses sometimes strengthened the walls, but there were no foundations in our sense of the word. The structure proper merely rested on the summit of its artificial hill. Notwithstanding, the Chaldean was a very careful builder, having, for example, pierced his gigantic walls with a system of tiny tunnels or ventilating-pipes, that the interior of the mass might become thoroughly dried. In Assyria such pipes are absent; they could not have been preserved in the softer bricks that there were used. Adequate provision was everywhere made for carrying off the rain-water.

Assyrian stone construction was careful and skilful, and the architect was evidently able to make a more extensive use of lithic materials than he cared to attempt. The most interesting known example dates from the Second Assyrian Empire, from the palace of Sargon at Khorsabad. Stone was here employed to case the entire foundation mound. A system of "headers" and "stretchers" was used, and the stretchers of the lower courses are no less than six feet eight inches in height and thickness, and nine feet in length. On the outside face the stones were carefully dressed, and they were perfectly smoothed where they touched one another and the joints formed with the utmost niceness, no mortar being used; but the inside face which met the crude brick was wisely left in a rough state. The entire height of this wall was sixty feet, including the parapet which rose five feet above the platform, and was formed of battlements finished with open crenellations of brick. In the wall that surrounded the town stone was also used, but only to form a plinth four feet high, above which rose crude brick to the height of forty feet, and being *eighty feet* in thickness.

It will be readily seen even from this brief description why it is that the ruins of Mesopotamia are ruins indeed; wrecks beside which the monuments of Egypt seem in perfect preservation. Her gigantic structures were mere masses of unburnt clay, protected only by a thin outer covering of stone or burned brick. Rain was frequent, and often fell with torrent-like force, so we find no sloping walls as in Egypt, since these would have given too great a chance to its activity; but even the perpendicular wall and the well-drained roof and terrace must have been in constant danger of taking in water through the rifts in their revetment; water which once admitted into the core of crude clay, did speedy and almost hopeless damage. If argus-eyed care was once relaxed, disintegration and destruction inevitably followed. So when we read how the great cities of Chaldea and Assyria were one after the other conquered, desolated, and abandoned, we do not wonder that each has in the course of time become, as the prophets of Judea proclaimed "a heap," and nothing more; a natural-seeming hill, weather-worn and seamed by the flow of temporary torrents, a hill which only the spade of the explorer proves to be of human workmanship.

M. G. van Rensselaer.

THE ILLUSTRATIONS.

THE GREAT HOUSE, AT ANDELYS, FRANCE.[1]

THE subject of this plate existed in 1818, as it is here represented, shorn, indeed, of much of its ancient splendor, reduced from the residence of a nobleman to a granary, and most probably curtailed of full two-thirds of its size, as retaining apparently little more than that portion of the square which fronted the court-yard, together with a small part of one of its wings. It can now (in 1821), only be spoken of as a building that did exist: last year saw it levelled with the ground. The following description of it is transcribed from Mr. Turner's "*Tour in Normandy*." "Andelys possesses a valuable specimen of ancient domestic architecture. The Great House is a most sumptuous mansion, evidently of the age of Francis First, but I could gain no account of its former occupants or history. I must again borrow from my friend's vocabulary, and say that it is built in the 'Burgundian style.' In its general outline and character, it resembles the house in the Place de la Pucelle, at Rouen. Its walls, indeed, are not covered with the same profusion of sculpture; yet, perhaps, its simplicity is accompanied by greater elegance: — The windows are disposed in three divisions, formed by slender buttresses, which run up to the roof. They are square-headed, and divided by a mullion and transom. The portal is in the centre; it is formed by a Tudor arch, enriched with deep mouldings, and surmounted by a lofty ogee, ending with a crocketted pinacle, which transfixes the cornice immediately above, as well as in the sill of the window, and then unites with the mullion of the latter. The roof takes a very high pitch; a figured cornice upon which it rests, is boldly sculptured with foliage. The chimneys are ornamented by angular buttresses; all these portions of the building assimilate more or less to our Gothic architecture of the sixteenth century; but a most magnificent oriel window, which fills the whole of the space between the centre and the left-hand divisions, is a specimen of pointed architecture in its best and purest style. The arches are lofty and acute. Each angle is formed by a double buttress, and the tabernacles attached to these are filled with statues; the basement of the oriel, which projects from the flat wall of the house, after the fashion of a bartizan, is divided into compartments, studded with medallions, and intermixed with tracery of great variety and beauty. On either side of the bay, there are flying-buttresses of elaborate sculpture spreading along the wall. As, comparatively speaking, good examples of domestic architecture are very rare, I would particularly recommend this at Andelys to the notice of every architect whom chance may conduct to Normandy. This building, like too many others of the same class in our own counties of Norfolk and Suffolk, is degraded from its station. The Great House is used merely as a granary, though, by a very small expense, it might be put into habitable repair. The stone retains its clear and polished surface; and the massy timbers are undecayed. The inside corresponds with the exterior in decorations and grandeur; the chimney-pieces are large and elaborate, and there is abundance of sculpture on the ceilings and other parts which admit of ornament."

[1] From Cotman's "*Antiquities of Normandy*."

HOUSE FOR S. MUZZY, ESQ., PATERSON, N. J. MR. CHARLES EDWARDS, ARCHITECT, PATERSON, N. J.

MORTUARY CHAPEL FOR FOREST HILLS CEMETERY, BOSTON, MASS. MESSRS. VAN BRUNT & HOWE, ARCHITECTS, BOSTON, MASS.

CLOISTER OF THE MONASTERY, AT BELEM, PORTUGAL.

HOUSE OF J. A. AMMON, ESQ., CLEVELAND, O. MR. J. A. SCHWEINFURTH, ARCHITECT, CLEVELAND, O.

A SKETCH of the other front of this house was published in our issue for August 20, 1881.

STORE FOR MR. JOHN C. MYERS, ALBANY, N. Y. MESSRS. OGDEN & WRIGHT, ARCHITECTS, ALBANY, N. Y.

THE material used in this building is iron for lower story, pressed-brick and terra-cotta for the upper stories and the roof is covered with red tiles.

THE WARMING AND VENTILATION OF FRENCH SCHOOLS.

THE 'STATUE OF LIBERTY' ON ISLAND NEAR LITTLE 'BEDLOE'

THE warming and ventilation of the Lycée Condorcet is a good illustration of the modern system and of the newest improvements. The class-rooms, so far as light and ventilation are concerned, are disposed in the same manner; but they are warmed by steam under slight pressure. The steam is generated within a multitubular boiler of the Naeyer de Willebrœck type, so as to avoid all risk of explosion. From the basement, where the boiler stands, the steam goes straight up to the attic, where it passes through a reducing valve. This apparatus is round in shape, and divided by a copper disc or plate, which becomes either convex or concave as the pressure or expansion pushes one way or the other. By the movement of this plate the steam supply is so regulated as to be always at a very low pressure. This has the advantage of insuring an even distribution; otherwise the steam, if at high pressure, would rush into the first opening instead of travelling slowly but surely over the whole building.

In the place of the chimney from the stove we have two steam coils passing along the wall of the class-room. The upper and larger coil gives off a considerable quantity of heat. It is placed as near as possible to the bottom of the window, to counteract the chilling influence of the large surface of glass. The fresh air from the outside is admitted at a height of only a few inches from the floor, and here it is only slightly warmed by passing over the second and much smaller steam coil. The air is really not warmed; the chill only is taken off. The side walls are also warmed by a steam coil; thus no down-draught can occur, and the pupils are enveloped all round with heat that radiates upon them, and that is distributed in proportion with the causes of cold. Thus the same temperature is noted in every part of the room. The fresh air, entering almost on a level with the floor, is warmed and vitiated as it rises and comes in contact with the pupils; but then it continues to travel upwards till it reaches the ceiling, where it is drawn off by shafts communicating with lanterns in the roof containing gas-burners or other contrivances to accelerate the up-current.

Further it should be noted that the whole of this system is regulated from the outside, without in any way disturbing the pupils during their studies. An attendant goes the round periodically of each class. A small opening in the wall, protected by glass, enables him to see a thermometer placed within the class-room, and, according to the degree of heat recorded, he turns the steam on or off. The fact that the supply of heat for each room is in this manner absolutely independent is a most important consideration. One class-room, crowded with pupils, may require ventilating rather than warming; at the same time the next room may be differently situated, and, exposed to colder winds and with fewer pupils, would want very much more artificial heat. These exigencies are met by the use of a steam-trap, invented for this express purpose and applied to each warming-apparatus. This trap allows the escape of water and air into the main return-pipes, but retains the steam. There is, consequently, no counter pressure from the return main pipe, and therefore the supply given to any one room can be entirely stopped or resumed at will. Such modification in no wise affects the neighboring rooms. Now that these facilities have been created, the greatest severity is displayed in the matter of maintaining even temperature. For the winter months this is fixed at 15° to 16° centigrade (58° to 60° Fahrenheit), and if a variation occurs exceeding one degree centigrade either way, a reprimand and even punishment is inflicted.

The Lycée Condorcet is a superior school, built in a very crowded district, with places for six hundred pupils. The impossibility of obtaining sufficient land rendered it necessary to build to the height of four stories. The installation of the apparatus, etc., for warming and ventilating amounted to £4,080, or a little over six guineas per head. The working expenses for coal, the stoker, the attendant, etc., amount to £340 per annum, but of course the results attained are far more reliable than in the primary schools, where a mere stove alone is employed. — *The Builder.*

THE SUBSTITUTION OF IRON AND STEEL FOR WOOD IN RAILWAY SLEEPERS.

A PAPER on the above subject to which we alluded a short time ago, was recently read before the Institute of Iron and Steel, by Walter R. Browne. After a few prefatory remarks the author said: — Every engineer who is conversant with the technical literature of Germany must be aware that the superiority of metal over timber sleepers, and their eventual substitution for them, is there no longer a matter of doubt. The fact is practically admitted on all hands; the miles of line laid with metal are counted by thousands, and the weight of iron and steel employed by hundreds of thousands, if not millions of tons. The points which do remain in doubt, and on which controversy still rages, concern merely the precise form which the permanent way of the future is to take; whether the metal is to be iron or steel, whether the sleepers are to run lengthwise or crosswise, and what is the particular mode of fastening to be adopted for uniting them with the flat-footed rail which is the general type on the Continent.

With these questions the writer will not here concern himself. His object is to discuss solely the introduction of iron or steel sleepers in England. Now to any one acquainted with English railway engineers it will be tolerably clear that no system is likely to meet with any favor unless the new sleeper is able at once, and without inconvenience, to replace the old one. With one marked exception, the main lines in England may now be said to be laid with double-headed rails in cast-iron chairs resting upon a transverse sleeper; and if an iron sleeper is to be speedily adopted, it must be one which can go at once into the place from which an old wooden sleeper has been withdrawn, utilizing the same rails, and if possible, the same chairs as before. This being so, the whole subject of longitudinal sleepers (which have met with much favor in Germany), may here be left out of discussion. In the single exception alluded to above, namely, that of the Great Western Railway, such sleepers, should indeed be of special utility in replacing the very expensive oak longitudinals which are in use on that line; and probably the subject has already attracted the attention of the engineers of that company. But, for the present, attention may be directed to cross sleepers only. For the same reason, the bowl sleepers so largely used by Mr. Livesey, Mr. Batho, and others, and the bowl-shaped cross sleepers now being introduced in India by Mr. A. M. Rendel for flat-bottomed rails, will not here be discussed.

Now the experience in Germany, which by this time is very large, enables us to lay down with confidence the following statements.

First, the corrosion of the sleepers, as to which fears were once expressed, is found to be insignificant. Like the rails, they do not rust so long as the traffic is frequent and regular; and no shortening of their life is to be feared from this cause.

Secondly, the elasticity of the road, as to which doubts have also been expressed, is perfectly satisfactory, no complaints having been heard as to hard running. This will be a matter of little surprise to any one who reflects that iron or steel is in itself a far more elastic material than soft wood, and retains that elasticity immeasurably better under the conditions of daily use.

Thirdly, the connection of the rails to the sleepers has proved a matter of some difficulty, and many ingenious, and more or less complicated devices have been brought into use. Satisfactory results have been attained; but this does not concern us at present, because we have to do, not with flat-bottomed, but with double-headed rails. Such rails can only be secured in chairs, and these chairs rest, of course, on the flat top of the sleeper, and can be bolted or riveted to it as desired.

Fourthly, the point which in Germany has been found to give most trouble is the tendency of the sleepers to shift endways when laid upon sharp curves. This question is ably discussed in a recent paper by Herr Meyer, of Berlin (*Railway Organ*, 1884, p. 9). He observes that wooden sleepers offer greater resistance than iron ones to such endway motions, for three reasons. In the first place, their weight is greater, and they are therefore, less disturbed by sudden shocks. Secondly, their ends have a much larger area to bear against the ballast, in which they are in general deeply embedded. Thirdly, their co-efficient of friction with the ballast is very much higher, not merely because timber is rougher than iron, but because the sharp gravel actually bites into the soft wood, as it cannot do into the hard metal. The iron sleeper bears upon the ballast only at a few points, and is thus easily movable. In addition the vibration and the churning of water below the sleepers frequently turn the bed into a layer of greasy mud, over which sliding is easy.

In Germany, this difficulty has been overcome in two ways; either by bending down the ends of the sleeper, or by riveting angle-irons or other dividing plates to its bottom. The first is not very efficient; and the second, though successful, adds materially to the weight and cost. Herr Meyer's own suggestion is to put the sleepers in pairs crossing each other in the form of a St. Andrew's cross. One of them is of course cranked up in the middle, so as to pass over the other, and is riveted to it. This, though it would no doubt be efficient involves a decided complication; and in point of fact nothing of the kind seems necessary on English railways. In the discussion above mentioned before the Institution of Civil Engineers, Mr. Wood called attention to the greater length of English as compared with Continental sleepers (nine feet and seven feet) respectively, and showed two diagrams. Assuming, as is no doubt the case, that there is always a certain shrinking of the ballast under the rails, an inspection of these diagrams showed at once how much more liable the short sleeper is than the long to such endway shifting. If we investigate what the tendency to such shifting is, we find that, supposing a train to pass at a speed so high as sixty miles an hour round a curve of only ten-chain radius, the so-called centrifugal force or outward pressure will not exceed one-third of the weight in motion. When we consider the resistances to be overcome before a sleeper nine feet long can move endways through the ballast, and also take into account the elevation of the outer rail, it is clear that the co-efficient of resistance will in all ordinary cases be much greater than this. Moreover English railways have a great advantage in this respect from the much coarser and drier nature of their ballast. No such greasy surface of mud as Herr Meyer describes can be formed in the clean gravel, burnt clay, or broken stone, which form the ballast of English railways.

The writer has dwelt particularly upon this point because it is the only one which appears at present to present even a semblance of difficulty; but here, as in all similar cases, experience is the safest guide, and as a matter of fact, a number of Mr. Webb's wrought-iron sleepers, which are laid in South Wales on a curve having a radius of only ten chains (660 feet), and on a gradient of one in forty, are reported to show no signs whatever of endway shifting.

The sleepers just mentioned may now be described, as forming the most successful instance, and on by far the largest scale of the application of metal sleepers in this country. These sleepers are rolled from Bessemer steel ingots, ten-and-one-half inches square in a three-high mill, and come out as bars sixty to seventy feet long, which are afterwards cut into length. They are then punched with six holes

for the chairs, the holes being punched from both sides so as to make them slightly tapered in the middle, and so ensure the firmness of the rivets. The chairs are of steel, made from crop-ends of rails and other scrap. This scrap is heated in a mill furnace, and rolled into bars; the bars are cut up, whilst hot, into lengths, and each length is placed still hot in a die beneath a steam hammer, and stamped at one blow into the shape of a half-chair. This half-chair is then punched still hot, is put back into the die, and receives a second blow, which removes all burrs, etc., and finishes the manufacture. The lining-plate between the chair and the sleeper is also rolled out of crop-ends, and sawn up hot to the proper length. It is set in the middle in such a way as to give a firm base to the foot of the rail. Between the chair and lining-plate, and between the latter and the sleeper, are inserted liners of brown paper soaked in tar; these fill up any little interstices, so that no water or dirt can get in between the surfaces, and prevent any possibility of shaking loose or clattering, and bind the whole into one coherent mass. All the parts — chairs, lining-plate, liners, and sleeper — are now fitted together and riveted up by a Tweddell hydraulic riveter. The moment this is completed, the distance between the rails is absolutely fixed, and so long as the keys are in place any spreading of the gauge (the source of so many accidents) is rendered impossible.

The keys themselves are of the ordinary kind and shape, and are never found to work loose under any circumstances. This is due partly to the elasticity of the steel chair, which follows the wood in case of any contraction, and continues to grip it tightly; partly to the recess which is formed at the centre of its length, as shown in the section. The wood swells out into this recess, where it is not exposed to pressure, and this swelling acts like a feather on the key to prevent any endway motion.

The weight of the whole arrangement is 174 lbs., made up as follows: —

	Lbs.
Sleeper 9 feet long	124
2 chairs	28
Rivets	5
2 lining-plates	15
2 oak keys	2
Total	174

The weight of a creosoted wooden sleeper of the kind used on the London and North-Western Railway, complete with chair, spikes and screwed spikes, and felt liners, is 242 lbs.

This difference in weight and bulk might be of considerable importance in the case of shipping sleepers to distant countries.

With regard to cost, Mr. Webb's figures show that a creosoted timber sleeper, complete with chairs, etc., as described, is rather cheaper than the steel sleeper. It is to be observed, however, that while the price of steel is ever tending downwards, the timber is gradually getting scarcer and dearer, and a very slight change in this respect would bring the two to an equality. Again, it may well be found that a somewhat thinner, and therefore cheaper sleeper will answer all requirements. Still it will be better to accept the fact of the excess in cost, and to consider whether there are not certain advantages on the side of the steel sleeper which may make this slightly increased cost a good investment. Some of these advantages may be enumerated as follows: —

1. The life of a timber sleeper, as shown by the extensive researches made in Germany, is a very uncertain quantity, depending on the kind of wood, its seasoning, its pickling, and the conditions of ballast, traffic, climate, etc., to which it is exposed. Probably the extreme limits may be taken at one and twenty years, and fifteen years will be a very favorable estimate as an average. On the other hand, the iron sleepers laid down on the Bristol and Exeter Railway thirty-one years ago are still in use; and it does not seem possible to lay down any definite limit to the life of such a system as Mr. Webb's. There are absolutely no parts exposed to wear, and corrosion, as has been already pointed out, does not occur so long as the traffic is frequent; whilst, if necessary, it can be prevented altogether by dipping the sleeper in any tarry solution, as, in fact, is done at present.

2. There is no possibility of the guage spreading, as it often does when the fastenings can cut into the timber sleeper. Moreover, the keys, as already mentioned, do not work loose. Hence the labor and cost of maintenance will be very greatly diminished, and with them the risk of accident from the causes just mentioned.

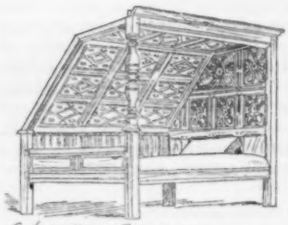
3. In the case of derailment the permanent way is far less likely to be injured than where the sleepers are of timber, and therefore liable to be cut and crushed by the wheel flanges. In an actual case (mentioned by the writer on a previous occasion) a derailed train ran some distance over a line which was laid at one part with wood and at another with iron sleepers. The result was that all damage done to the latter was repaired, and the line ready for traffic, long before the *débris* of the wooden sleepers had even been cleared away.

4. In severe weather the moisture which has soaked into wooden sleepers freezes, and the road thus becomes hard and inelastic. This is probably the main cause of the well-known fact that breakages of rails, tires, etc., are much higher in winter than in summer. In the steel sleeper this cannot occur; and although the ballast may freeze beneath it; yet owing to the thinness and conductivity of the metal a very slight rise in the temperature above freezing point will suffice to thaw it again.

5. A last advantage, but as the writer hopes not the least from the point of view of his present audience, is that the use of steel sleepers would give employment to the capital and labor of our own country, now suffering under so severe a depression. On the other hand there is not a single sleeper upon an English railway which has not been imported from abroad, and of which almost the whole cost has not gone to swell the resources of other and competing nations.

In conclusion, the writer feels it needful to apologize for the necessarily incomplete character of this paper, which has been prepared at very short notice in response to a suggestion kindly made by the President of the Institute. He desires that it should merely be regarded as the starting-valve, so to speak, for a discussion. But, in fact, the case appears to him so strong as to need little advocacy. The problem of metallic sleepers has been thoroughly mastered in Germany, and worked out with all the exhaustive care and skill for which the engineers of that country are celebrated; while its solution, in the particular form demanded by English conditions, appears to the writer to have been satisfactorily achieved by Mr. Webb. Nor can it be said that this solution is a theoretical one merely. Some 40,000 of these sleepers are now in use, and some of them have been down for a period of three years. They may fairly claim, therefore to have answered the test of practical work. It remains to ask why their introduction is still so slow and so doubtful. Is the answer to be found in the remark made by an eminent engineer during a former discussion, in which he congratulated English railway companies on the caution and slowness of their advisers, whereby they had avoided the failures which in many cases had been experienced on the Continent? If English engineers have thus begun to take pride and to assume credit for being in the rear of progress, instead of in the van, it is not to be wondered at if the manufactures of England are threatened with ruin, and our industrial supremacy with defeat. Mr. Webb, has, however, already falsified the prophecy then made, that no engineer of sound judgment would ever entrust to iron sleepers the carrying of such a traffic as that of the London and North-Western Railway; and the writer has been glad to learn within the last few days that the engineers of other lines are beginning to follow in the same track. He hopes, therefore, to see the time, before many years are over, when the importation of timber into England for the making of sleepers will be looked back upon as a curious delusion of the past, and useful works be found for our steel works at home.

BUILDING IN DUBLIN.



CANTED ROOF BEDSTEAD AT TABLEY OLD HALL, CHESHIRE. ENG. (BEDSTEAD)

THE following extraordinary statement by a workman has appeared in one of the Dublin papers as an illustration of the causes which have increased the price of building in that city. If it be true, it is no wonder that the estimates for the proposed museum have exceeded the contemplated amount: —

A contractor has a building in course of erection, and he for such orders a hundred thousand of bricks from some of the brickmasters in the locality where such are made. The price of the materials ordered, at a rough summing up, amounts to £300. Through the dishonesty of the contractor's men in charge of the works, two-thirds alone of the whole amount are delivered to the buyer, thus leaving the contractor at £100 loss on that transaction. Here is how the fraudulent schemes are worked. The brickmasters give their carters, when leaving their brick-yards, dockets or invoices of their loading, stating what amount of bricks each driver has in charge. The signing of the invoices by the builder's foreman or clerk-of-works stands, when returned to the brickmaster, as a receipt of the goods delivered. Now the signing of the invoices is managed thus: the foreman writes his name on all the invoices presented to him for such, whilst he is fully aware there is one of every three horse-loads, to use the trade term for such, "hobbed," that is, sold and delivered to some roguish purchaser at half-price or less. Half of the money procured by this scheme of robbery must find its way into the foreman's hands; if not, the fraud must cease.

The foreman then, and his dishonest accomplices, lavish their ill-gotten coin on the procuring for themselves and others drink and the foul sources of immoral pleasures. The plunder is not retained exclusively by the foreman and carters, but generally all hands engaged at the building have their share of the booty. So far is such carried that all sober and well-inclined workmen are almost completely "boycotted" by their fellow-workmen. To express yourself averse to the robbery practised is to solicit dismissal on the Saturday evening following from the hands of the man in charge. This is how our mechanics can spend more than their honest income in the fetid backways of our city. All engaged at a building must, with the rarest exception, be supplied with beer-money by traders in lime, stones and sand, etc; if not, the trader's goods, be they ever so free of defect, will be objected to by the hod-men and their fellow-conspirators. This raising of blackmail is one reason why building is costlier in Dublin than elsewhere. The robbing of building-contractors by their employés, and carters of brickmasters, etc., of thirty-three per cent on the principal materials used, namely, bricks, stones, sand and lime, must undoubtedly make building more expensive in Dublin than elsewhere, as the building-contractors learn from bitter experience

that materials are in the total very costly affairs; so to clear themselves of destructive loss they must raise their charges to intending employers to figures which will cover all expenses and leave a margin suitable to live on. They must so be thirty-three per cent higher than legally required if honestly dealt by at the hands of their employés. Take the builders of anywhere else into comparison with them, and the great difference of prices is seen immediately. Not to give too much credit to the workmen and foremen of other places for honesty, we can plainly see twenty per cent for robbery would even leave builders a good profit on the same amount of work. A fact I will now allude to will suffice to prove the evil effects of the fraudulent schemes spoken of to native industry. In one locality within four miles of Dublin, where a few years ago a dozen of brick-yards were in full swing, there are now but two. The builders found the County Dublin bricks ran very short in work (from reasons the reader is already acquainted with), and so they now send their orders across the Channel. Irish workingmen, and Dublin artisans in particular, should think of that.

METROPOLITAN SEWAGE DISPOSAL.[1]

Of all the many fearful muddles and failures of systems with which we have become so familiar within the last few years, that of the Thames drainage stands out in gigantic prominence, and it is hard to say whether the Lower or the Upper Thames has come the worst off, although from different causes. Below bridges, we have expended millions in constructing what appeared to be the most perfect drainage system in the world; and after the experience of a few years' working, we find that we have succeeded in paving the bed of the Thames with a new and fictitious bed of excremental matter; that, instead of getting rid of our sewage far out at sea, as was hoped and intended, it is, like the poor, always with us, churned backwards and forwards with the tide, and each day presenting a more threatening aspect to the public health. Above bridges, millions have certainly not been spent, but thousands have, not in perfecting a system of drainage, but in most ingeniously contriving to prevent any system at all being made.

The London area of drainage north of the Thames is fifty-three square miles, the sewage of which is collected in reservoirs of nine-and-one-half acres at Barking, the capacity of these being 35,000,000 gallons, or 5,600,000 cubic feet. The drainage south of the Thames is sixty-six square miles, the sewage being collected at Crossness in reservoirs of six-and-one-half acres, and in capacity of 25,000,000 gallons, or 4,000,000 cubic feet. The average daily discharge of sewage into the Thames is 164,000,000 gallons, the Lower Thames receiving about 60,000,000,000 gallons in the course of a year, the amount of suspended matter being estimated by Professor Frankland, as long ago as 1879, at 1,354,000 tons. Of course, it is a matter of gigantic difficulty to deal with this mass of filth, and up to the point at which it is received at the outfalls, no fault can be found with the system. But here the mistakes appear to begin. At the time of high water, all that is done is to open the sluice-gates of the reservoirs for four hours during the ebb, and let the sewage pass into the tideway. As a matter of course, some will go out to sea, but the bulk only travels a short distance down the river, to be brought up by the next tide, while a certain proportion is deposited, and, in point of fact, the volume of the river is physically unable to carry it away.

Two questions naturally strike one here. 1. Why is not the public health better protected? 2. Why are no endeavors made to utilize the sewage and reduce the expenses? Here we are met with the old bugbear of expense, as if the health of the people was a matter to be regulated by pounds, shillings, and pence, and was not paramount over all such faulty considerations. If we are too poor to devote a few millions to this end, let us do away with the luxury of an annual war in our foreign possessions for a few years; let us cut down some of the extravagant expenses of the School Board; anything, indeed, to insure the primary duties of a government towards the population. To begin with, at any cost this mass of pestilence-breeding sewage should be deodorized or rendered innocuous, if nothing else is done; but that is not enough, it should also be taken out of sight and out of smell of London city, and not be let go until it is cast fairly into the sea. We are told that to extend the outfall works to Tilbury, fifteen miles lower down the river, would cost nearly three millions sterling, and that the pumping would represent another million. Very good, so far. But why stop at Tilbury? It is only partially lessening the evil, besides ruining the navigation of the river below Gravesend.

I say that the only plan, and the cheapest in the end, is to convey the sewage of London straight across the Essex marshes to Foulness Island, a little to the north of Shoeburyness, and there, if possible, cast it into the German Ocean, from whence there is not much chance of its returning. And why I say emphatically that this plan will be the cheapest in the end is because you will have here all the elements of a successful locality to deal with the sewage from a manufacturing point of view. Surely, unless our boasted scientific knowledge is all a sham and a delusion, some one of the many projects for converting sewage into a practical manure, and therefore of financial value, may be, after due consideration and further experiments, adopted with success. Space is of no object in Foulness or Wallasca Islands, and I see no reason why a busy manufacturing district should not arise, and a brisk trade in artificial manure be carried on from a harbor on the River Crouch, to which ships from all parts might resort; inland also, by means of railway extension. Even in the case of failure we should, at all events, secure a fair amount of immunity from epidemics and pestilence, which, even at a money computation, would be invaluable.

My belief is (whatever it may be worth), that an automatic power is needed to deal with the whole subject *ab initio*, so that the drainage of the Thames, from Windsor to Gravesend, should be under one strong hand, and should be made part and parcel of one scheme. I believe also that that one scheme should be the transportation of all this sewage to some place like Foulness Island, there to be dealt with commercially by the most approved form of treatment, and that at the same time, while not interfering unduly with the vested rights of the existing water-companies, I believe that an additional and independent supply of the very best water possible should be procured and brought to London.

[1] From a paper by G. Phillips Bevan, read before the Balloon Society.

THE FEE FOR A PURCHASING AGENT.

Boston, Mass., October 2, 1884.

To the Editors of the American Architect:—

Dear Sirs,—Will you please inform a reader of your *Architect*, in your next issue, what are proper charges for an architect, when he undertakes to build in Boston, for a party in affluent circumstances a block of brick buildings, and makes all plans, details, specifications, contracts, etc., buys all materials, and sub-lets each part of the work separately, and gives almost daily superintendence; and whether there should not be a separate commission on the amount of materials purchased, and what it ought to be when no outside commissions are taken? Yours respectfully, A Subscriber.

[This is an unusual case, and there is no custom which would regulate the amount to be paid for work of this kind, outside the ordinary professional service. Perhaps the best way would be to keep, as nearly as possible, an account of the time occupied in extra duties, and charge for it at a reasonable rate by the hour.—Eds. American Architect.]

THE KNOX COUNTY, TENN., COURT-HOUSE.

Knoxville, Tenn., October 13, 1884.

To the Editors of the American Architect:—

Dear Sirs,—My attention has been called to an article in your number of September 13, in reference to the Knoxville (Tenn.) Court-House, which does great injustice to the successful architect, and gross violence to the truth. Of course this is the fault of your informant, and not of yourselves.

It is true, as you state, that a committee composed of members of the county court selected the plan submitted by Mr. Tinsley. Whether the action of that committee was tentative or final, and their functions advisory or potential, are vexed questions upon which an opinion is unnecessary. Suffice it to say, Mr. Stephenson accepted the committee's award as final. But the members of the Knoxville bar, who must spend the greater part of their lives in the contemplated structure, were unwilling that Mr. Tinsley's errors and incongruities should be perpetuated in marble and mortar, at the cost of the county and their comfort. A meeting of the bar was held, at which practical unanimity prevailed that the plan of Mr. Tinsley was in no wise suited to the wants and demands of the county. A committee, composed of the oldest and most eminent lawyers of Knoxville, was appointed to present the views of the meeting to the county court. At the instance of this committee a petition was prepared, specifying the objections to Mr. Tinsley's plan, and the advantages and superiorities of Mr. Stephenson's. This petition was signed by every member of the Knoxville bar, save three, only one of whom preferred the plan of Mr. Tinsley.

This petition was presented to the county court, and, by a vote of thirteen to three, Mr. Tinsley's plan was rejected and Mr. Stephenson's adopted. Do you think there could have been such practical unanimity in the bar and the court unless there had been decided objections to Mr. Tinsley's plan, and decided superiorities in Mr. Stephenson's?

The reopening of the question and the adoption of Mr. Stephenson's plan was wholly the result of the labor of the members of the bar, in which Mr. Stephenson had no part. Of the five members of the bar committee, only one had any acquaintance with Mr. Stephenson. I prepared and presented the petition, and had never met Mr. Stephenson until after the entire matter was concluded.

Your statement that "the question was renewed at the instance of defeated competitors, and of attorneys acting in their interest," is unfounded and unjust. Very truly, Wat. M. Cocke.

A QUESTION OF FRICTION.

Topeka, Kansas.

To the Editors of the American Architect: —

Dear Sirs,—I wish to take exceptions to the statement of Col. Ludlow, Superintendent of Philadelphia Water Supply — referred to in your editorial of September 13 — that "the pressure in the main of seventeen pounds to the square inch was reduced in the house, at nearly the same level to seven pounds, by obstructions in the pipe." Leaving out of the question the element of friction the *pressure* in the house (at the same level) would be the same in spite of the obstruction, and in substantiation of this would refer to the experiment of Pascal in 1647, at Rouen, p. 155, "*Silliman's Physics.*"

Truly yours, L. M. Wood.

[Of course Mr. Wood is right "if the element of friction," as he says, "is left out of the question," but in Colonel Ludlow's experiments it was not left out of the question. If the owner of the house referred to, tried to sprinkle his lawn with water drawn from the kitchen faucet through a hose, and found that the water would not run out of the nozzle, although the guaranteed pressure in the main was sufficient to throw a stream fifteen feet above his head, it would be hard to persuade him that the tension in the main and in the hose were the same. Undoubtedly they would become the same if the hose were shut up tight and allowed to fill, but that is a different matter. — Eds. American Architect.]

SEIZING DRAWINGS TO SECURE PAYMENT.

New York, October 3, 1884.

To the Editors of the American Architect: —

Dear Sirs, — Has a draughtsman any right under the lien law of the State of New York?

A, an architect, employed B to make certain designs and drawings for which he stipulated to pay a certain sum per week, B worked for a number of weeks till the drawings were completed, when there was still a considerable sum unpaid. A had not been in the office for a long time, and had paid no attention to demands for salary, so B seized the drawings and still holds them. A has not made any demand on B for the plans, nor has he been heard from in any other way.

In the meantime, the owner of the property secured a "blue print" copy, and is proceeding with the work, and when spoken to by B about the matter, refused to have anything to say to him.

Is there any remedy for B? Yours respectfully, B.

[We do not think that B can help himself much under the circumstances, and the lien law, which in New York has been expressly decided to be inapplicable to the designer of a building, will do him no good whatever. He made a great mistake in carrying off his drawings, and has probably forfeited by that unwarrantable act his prospect of being paid for them. As the case stood before that, he had a simple contract with A to render a certain service, in consideration of certain payment. If he had carried out his part of the agreement in good faith, it would be a trifling matter to compel A, if he were responsible, to fulfil his promise to pay for them; but as B chose to take the law into his own hands, and deprive A of the use of his drawings, his service to A is incomplete, and as A's contract with B was not for half-finished work, but for full service, he can claim, with considerable reason, that B has not done what he agreed to, and he therefore owes him nothing. As against the owner, his claim is even weaker than against A. As we suppose, A was to have the privilege of doing what he liked with the drawings made for him by B, and if he chose to give the owner blue prints of them he had a right to do so, and the owner is not accountable to any one, unless perhaps to A, for the use he makes of them. Whether A has paid for them or not does not concern the owner in the least, nor can he in any way be made responsible for the cost of making them. We repeat, that if B had carried out his agreement to the end, he could easily have obliged A to pay the promised compensation, provided A had property enough to cover it, and if A was indigent and irresponsible, B worked for him at his own risk, and has no right to try to make any one else pay his bill. — Eds. American Architect.]

NOTES AND CLIPPINGS.

Cremation at Paris.—Cremation is making great strides in France. The Prefect of the Seine means to establish Siemens furnaces in several of the cemeteries of Paris, and proposes to cremate all persons whose bodies are not claimed by their friends. If this experiment proves successful, the Government will probably introduce a general bill on cremation.—*Exchange.*

Paper Houses. — Paper houses are coming into use in England, where for some purposes they are found greatly superior to tents. Shooting boxes 12 feet square were found convenient both to use and transport, and, the material being impervious to moisture, the little cottages are satisfactory from a sanitary point of view. It is said that they will be used at the seaside during the coming season, not only for bathing houses but as "residences" for quiet bachelors of contemplative habits. — *Exchange.*

A Key to Aztec Writings. — A Mexican archæologist, Señor Don Damaso Sotomayer, who has devoted years to the study of Aztec monuments and temples, professes to have made important discoveries in the hieratic writings of the Aztecs. He feels confident that the discoveries he has made will enable him to decipher the Chaldean writings and other mysteries of the far Orient, from which he traces the emigration of the early races who settled this country, writes a correspondent from Mexico. When Dr. Le Plongeon of New York was here, some three years ago, he felt equally confident he had found a key to the hieroglyphs on the temples and palaces of Palenque and Uxinal. Dr. Le Plongeon and his energetic wife, to whose courage and industry the Metropolitan Museum of New York is indebted for copies of the mural designs of the palaces of those ruined cities, spent nine years in Yucatan making researches. We would be glad to hear how far they agree with Sotomayer as to the mysteries to be solved and revelations made by the key to the Aztec hieroglyphs, which they believe is theirs. — *Boston Herald.*

English Knowledge of Objects de Virtu. — In an article on the Fountaine collection, the London *Times* says: "It is the fact that most of the very finest works of decorative art that have been sold within the past ten years have gone out of the country; and in the Fountaine sale, had it not been for Messrs. Franks and Robinson and their syndicate, nearly everything best worth having would have gone to M. Lowengard, or M. Settiner, or M. Egger, or M. Clément, or if not to them, then to some London dealer buying for a French or German or American amateur. The truth is that we are being distanced, not only in taste but in knowledge, by our foreign rivals. As far as pictures and prints go, we have a fair number of good judges among us; but in the matter of *la haute curiosité* we must yield. For one Englishman who knows a rare book when he sees it, or who can tell a fine piece of majolica or ivory from a piece of the second order, there are twenty Frenchmen and Germans; and while this state of things remains, our choice possessions will undoubtedly tend to flow out of the country."

Cape Cod Canal. — The report of the minority of the Committee on Harbors and Public Lands, regarding the Cape Cod Ship Canal Company, contains some very important facts, among which are the following: —

1. No corporator named in the charter and no director or officer of the Canal Company has ever subscribed to any of its stock or pay anything whatever to the business of the company.
2. That the company has contracted with F. A. Lockwood to build the canal at $1.000,000 per mile, that Lockwood shall receive all the stock which is to be issued to him as the work advances, and that when he shall have received $5,000,000 of the stock, the company shall issue its bonds to that amount to the contractor to complete the rest of the work, so that the canal will represent $10,000,000 of money regardless of the cost of construction.
3. That the construction of the canal depends upon the success of the "dredger," in which the contractor is interested.
4. That it is contrary to public policy for one man to constitute a company which has authority to take more land than was ever before taken by a single corporation in Massachusetts.
5. That the company estimating the cost of the canal has made no provisions for the construction of the bridge, ferries, etc., which will be necessary, and no security has been furnished by the contractor for their construction.
6. That the conditions of last year's act have not been complied with and that nobody is now interested in the scheme except Mr. Lockwood, the contractor.
7. That the construction of the canal would interfere with the railroad, which is the only communication with the outside world.
8. That the contractor has not given the land owners any security for damages, but can enter upon the lands of private persons without permission. — *Engineering News.*

Greely's Arctic Observations.— At Montreal, Canada, on the 2d ult., Lieutenant Greely read a paper descriptive of his observations in the Arctic Regions, before the Geographical Section of the British Association for the Advancement of Science. The following is an abstract of the paper: Following but disagreeing with Lieutenant Ray, who expressed his disbelief in an open Polar Sea, Lieutenant Greely said he did not believe there was a navigable sea at the pole, but he was of the opinion that there was open water somewhere about. The geographical work of the Lady Franklin Bay expedition covers nearly 3° of latitude, and over 40° of longitude. Starting from latitude 81° 44′, and longitude 84° 45′, Lieutenant Lockwood reached, May 10, 1882, on the north coast of Greenland, latitude 83° 24′, and longitude 40° 46′. From the same starting point he reached to the southwest in May, 1883, Greely Fiord, an inlet of the Western Polar Ocean, latitude 80° 48′, and longitude 78° 26′. This journey to the northward resulted in the addition to our charts of a new coast line nearly one hundred miles beyond the farthest point seen by Lieutenant Beaumont, R. N. It also carried Greenland over 400 miles northward, giving that continent a much greater extension in that direction than it had generally been credited with. The vegetation resembled closely that of Grinnell Land. Among the specimens brought back, the Arctic poppy and several saxifrages were identified. About the 83d parallel, traces of the polar bear, lemming and Arctic fox were seen, and a hare and ptarmigan were killed. Lieutenant Lockwood and himself journeyed across Grinnell Land and examined into its physical condition, discovering, what may have been hitherto unsuspected, that between the heads of Archer and Greely Fiords, a distance of some 70 miles, stretches the perpendicular front of an immense ice cap, which follows closely from east to west the 81st parallel. The average height was not less than 150 feet. This ice cap, extending southward, covers Grinnell Land almost entirely from the 81st parallel to Hayes's Sound, and from Kennedy Channel westward to Greely Fiord in the polar ocean. In connection with the line of perpetual snow he said that on Mount Arthur it was not far from 3500 feet above the sea. From barometical measurements it appeared that the crest of Grinnell Land was of about 2500 feet elevation in front of the southern ice cap and 3000 feet near Mount Arthur. He took occasion to mention a fact that had surprised him. It was the discovery that when the tide was flowing from the North Pole it was found by his observations that the water was warmer than when flowing in the opposite direction. He took the trouble to have prepared an elaborate set of observations showing this wonderful phenomenon, which would evetually be published. To him these peculiarities were unexplainable, and he hoped that the observations would be studied by his hearers, and some explanation found in regard to the thermometric observations of the expedition. He remarked that the mean temparature of the year of the hourly observations was 5° below zero, which justified him in saying his station was the coldest point of earth ever reached.

BUILDING INTELLIGENCE.

(Reported for The American Architect and Building News.)

[Although a large portion of the building intelligence is provided by their regular correspondents, the editors greatly desire to receive voluntary information, especially from the smaller and outlying towns.]

BUILDING PATENTS.

[Printed specifications of any patents here mentioned, together with full detail illustrations, may be obtained of the Commissioner of Patents, at Washington, for twenty-five cents.]

305,743. DOOR-HANGER. — William B. Cogger and Henry A. Hamlin, Minneapolis, Minn.

305,747. ELECTRIC ALARM-SIGNAL. — Isaiah H. Farnham, Portland, Me.

305,750. WINDOW-REFLECTOR. — Adolphus Holberg, Troy, N. Y.

305,753. MANUFACTURE OF HYDRAULIC CEMENT. —Robert W. Lesley, Philadelphia, Pa.

305,754. MANUFACTURE OF PORTLAND CEMENT.—Robert W. Lesley and David Griffiths, Philadelphia, Pa.

305,756. JAMB-TILE FOR GRATES. — John V. Nicolai, Cincinnati, O.

305,757. MACHINE FOR BENDING TIN-ROOFING CLEATS.—Stanley A. Philips, Amherst, Mass.

305,774. PAPER-HANGER'S TABLE. — Lewis A. Young, Stanstead, Quebec, Can.

305,783. SASH-HOLDER.—Thos. A. Bereman, Mount Pleasant, Iowa.

305,826. BUTT-HINGE. — Benjamin F. Levering, Buckley, Ill.

305,838. GRATE-APPLIANCE.— Bridget Murphy, St. Louis, Mo.

305,847. PORTABLE FOUNTAIN SHOWER-BATH. — James C. Reed, New York, N. Y.

305,852. ORNAMENTAL CHIMNEY-CAP. — Michael Scholl, San Francisco, Cal.

305,916. WELL-TUBS.—Richard Gogin, Pine River, Wis.

305,940. STOVE.—William T. Lewis, Racine, Wis.

305,950. FIRE-ESCAPE.—Charles R. Morrison, New York, N. Y.

305,961. WRENCH.—Henry Reber, St. Louis, Mo.

305,970. MANUFACTURE OF HYDRAULIC CEMENT. —Sidney H. Short, Denver, Col.

305,989. HAND-CLAMP.—John W. Weiser, Chicago, Ill.

305,993. COMBINATION-TOOL.—Henry K. Austin, Reading, Mass.

305,996. DOOR-HANGER.—Geo. H. Burrows, Somerville, Mass.

306,012. VALVE FOR TRAPS FOR WASH-BASINS. — Chas. W. Garland, Oakland, Cal.

306,013. ASH HOLDER AND DUMPER — George M. Gross, Chicago, Ill.

306,020. STOP AND WASTE COCK. — John Kelly, Chicago, Ill.

306,042. AUTOMATIC WELL-CLEANER. — Alonzo Wright, Denver, Col.

SUMMARY OF THE WEEK.

Baltimore.

BUILDING PERMITS.—Since our last report forty-one permits have been granted, the more important of which are the following: —

W. L. Patterson, two-st'y brick office, 24′ x 26′, n e cor. Frederick Ave. and Payson St.

S. Norwood, 2 three-st'y brick buildings, e s Fremont St., n of Saratoga St.

Kane & Galloway, 2 three-st'y brick buildings, w s Hanover St., n of Fort Ave.

F. W. Bedford, 7 two-st'y brick buildings, w s Carey St., between Presstman St. and Patterson Ave.

C. Zerckle, 3 three-st'y brick buildings, w s Caroline St., n of Preston St.

Wm. E. Banks, 7 three-st'y brick buildings, e s North St., commencing s e cor. John St.

J. C. Valiant, three-st'y brick building, w s Madison Ave., between Eutaw and Orchard Sts.

Louis S. Berner, three-st'y brick building, e s Howard St., between Madison and Richmond Sts.

Detrick & Harvey, two-st'y brick factory, n s John St., between Greenmount Ave. and the Falls.

G. H. Dalrymple, 2 three-st'y brick buildings, n e cor. Broadway and Barnes St.

John White and others, 3 two-st'y brick buildings, n e cor. Fayette St. and Bradford Alley.

Wm. A. Moale, 6 two-st'y brick buildings, n s Randall St., between Battery Ave. and Durst St.

F. C. Fossett, 8 two-st'y brick buildings, e s Washington St., commencing n e cor. Biddle St.; and 3 two-st'y brick buildings, s s John St., between Washington and Chester Sts.

S. A. Downes, 3 two-st'y brick buildings, s s Warner St., between Henry and Covington Sts.

C. Mickelman & Sons, 10 two-st'y brick buildings, w s Holbrook St., s of Preston St.

E. W. Gorman, 6 two-st'y brick buildings, e s Patterson Park Ave., commencing n e cor. Fairmount Ave.

James A. Crocker, three-st'y brick building, e s Hanover St., between Fort Ave. and Clement Sts.

J. Poultney, 2 two-st'y brick buildings, w s Larewis Alley, between Centre and Franklin Sts.

Peter Bremer, 8 two-st'y brick buildings, commencing n w cor. Eagle St. and Addison Alley; and 12 two-st'y brick buildings, w s Addison Alley, n of Eagle St.

S. Chapman, three-st'y brick building, w s Greenmount Ave., between Townsend St. and North Ave.

Brooklyn.

BUILDING PERMITS.—*Duryea St.*, s s, 300′ e Bushwick Ave., two-st'y brick dwell., tin roof; cost, $3,300; owner, Elize E. Woodhouse, on premises; architect, H. Vollweiler; builder, S. Post.

Dupont St., No. 155, n s, 225′ w Oakland Ave., three-st'y frame tenement, gravel roof, brick-filled; cost, $3,800; owner, T. Desmond; architect, —— Dennon; builder, J. Ruehl.

Oakland St., No. 96, e s, 170′ s Norman Ave., three-st'y frame tenement, tin roof; cost, $3,800; owner, James McL. Taylor, 56 Oakland St.; architect and builder, George W. Cobb.

Myrtle St., s s, 125′ e Evergreen Ave., three-st'y frame tenement, tin roof; cost, $4,500; owner and builder, George Loeffler, 78 Jefferson St.; architect, H. Vollweiler.

Evergreen Ave., w s, 175′ n Troutman St., three-st'y frame tenement, brick-filled flat; cost, $3,000; owner, Theresia Kirchner, 112 Floyd St.; architect and builder, John Kirchner.

Pacific St., n s, 160′ e Kingston Ave., two-st'y brick dwell., flat tin roof; cost, $3,000; owner, E. Herd, 1541 Pacific St.; architect, D. T. Atwood; builder, James Herd.

Fulton Pl., e s, 100′ s Fulton St., three-st'y brick storehouse, flat gravel roof; cost, $6,000; owner, A. S. Robbins, cor. Sixth Ave. and Park Pl.; architect and builder, Joseph Platt.

Halsey St., n s, 250′ w Reid Ave., 3 two-st'y and basement brick dwells., flat tin roofs; cost, each, $4,000; owner and builder, Patrick Ward, 723 Gates Ave.; architect, M. Walsh.

Leonard St., e s, 375′ n Calyer St., four-st'y frame tenement (brick-filled) flat gravel roof; cost, $7,000; owner, John Wood, New York; builder, David Miller.

Pacific St., s s, 100′ w Sixth Ave.; Quincy St., s s, 500′ w Ralph Ave.; and South Second St., w Fifth St., 3 brick fire-engine houses, flat roofs; cost, each, $9,500; owner, Fire Department; architect, Engineer of Construction.

Stockton St., No. 340, 100′ w Lewis St., three st'y frame store and tenement, tin roof; cost, $4,500; owner, John Ruche, Humboldt St., near Stagg St.; architect, J. Platte; builder, George Loeffler.

Wallabout St., n s, 70′ s Harrison Ave., three-st'y frame tenement, tin roof; cost, $3,200; owner, Mrs. J. Kissel, 169 Harrison Ave.; architect, John Platte; builder, Jacob Hoeffer.

Withers St., n s, 150′ e Lorimer St., 2 three-st'y frame tenements, tin roofs; cost, each, $3,500; owner, Mrs. Frances Gleisch, North Second St., near Tenth St.; architect, E. F. Gaylor; mason, Matthew Smith.

Manhattan Ave., w s, 21′ n Fourth St., 2 four-st'y brick stores and tenements, tin roofs; cost, each, $7,000; owner architect and carpenter, 68 Nassau Ave.; mason, —— Van Riper.

Gates Ave., s s, 21′ 6″ e Franklin Ave., 3 three-st'y brick dwells., gravel roofs; cost, each, $7,500; owner and builder, James B. Alexander, 108 Pacific Ave., Jersey City; architect, A. Hill.

Chicago.

OFFICE-BUILDING.—Contracts are let for the erection of the Traders' Safety and Trust Deposit Company's building, at Nos. 5 to 11 Pacific Ave., seven-st'y, 90′ front, 80′ deep, Anderson red brick; cost, $250,000; Burnham & Root, architects.

BUILDING PERMITS. — F. Slade, three-st'y store and dwell., 623 Throop St.; cost, $6,000; architect, J. Rice; builder, M. Holce.

J. Hausen, two-st'y flats, 443 Thirty-seventh St.; cost, $4,000.

Mrs. A. E. Webster, four-st'y stores and flats, Madison St., cor. Ogden Ave.; cost, $45,000; architects, Hollibird & Roach; builders, W. A. and A. R. Wells.

A. M. Payne, 3 two st'y dwells., 32 to 36 Walton Pl.; cost, $11,000; architects, Treat & Foltz.

G. W. Smith, three-st'y store and dwell., Wells St., cor. Ontario St.; cost, $3,000; architect, E. Baumann; builder, E. Earnshaw.

Mrs. S. D. Leary, 2 two-st'y dwells., 3134-3138 Emerald Ave.; cost, $8,000.

F. Arndt, two-st'y dwell., 581 West Taylor St.; cost, $2,500.

Wm. Harms, two-st'y dwell., 688 West Twelfth St.; cost, $3,800; architect, A. Bessler; builder, J. C. Loman.

N. C. C. Railway Co., barn, 521 and 523 Sedgwick St.; cost, $20,000.

L. Harting, two-st'y dwell., 885 Hinman St.; cost, $2,700.

J. C. Graham, two-st'y dwell., 649 West Taylor St.; cost, $5,000.

L. Gathmann, observatory, 46 Lincoln Ave.; cost, $6,000; architect and builder, H. Fandock.

A. Wasmansdorff, two-st'y dwell., 549 Hurlbut St.; cost, $4,000; architects, Fromann & Jebsen; builder, A. Hernowsky.

Stein, Hirsh & Co., addition, 2585 Archer Ave.; cost, $2,500.

Turner & Bond, 2 cottages, 2943 and 3023 Wallace St.; cost, $2,500.

D. C. Lancey, two-st'y store and flats, 367 West Twelfth St.; cost, $3,100.

H. Helge, four-st'y store and flats, 122 Wells St.; cost, $9,000; architect, H. Rehwoldt.

Mrs. E. M. Clark, 3 two-st'y dwells., Rhodes Ave.; cost, $12,000; architects, Edbrooke & Burnham.

A. W. Merell, two-st'y dwell., Rhodes Ave. and Thirty-first St.; cost, $5,000; architects, Edbrooke & Burnham; builder, J. Rutherford.

Central Baptist Church, church, Halsted St. and Belden Ave.; cost, $6,000; architect, J. C. Cochrain.

H. Flentye, three-st'y flats, 608 and 610 Wells St.; cost, $10,000; architect, H. Rehwoldt.

B. P. Gibbs, two-st'y dwell., 3517 Indiana Ave.; cost, $5,500; architect, A. J. Toolan.

J. H. Wrenn, two-st'y dwell., 3251 Forest Ave.; cost, $3,500.

H. W. Caldwell, two-st'y dwell., 598 West Jackson St.; cost, $8,000; architect, C. L. Stiles; builder, H. Hibbard.

W. H. Palmer, two-st'y dwell., 459 Dearborn Ave.; cost, $6,000.

J. Jensen, 3 cottages, 749 and 751 North Leavitt St.; cost, $3,000.

J. O'Brien, three-st'y dwell., 205 Illinois St.; cost, $4,500; architect, Wilson.

E. Burke, 2 two-st'y dwells., 183 and 185 North Paulina St.; cost, $8,000.

W. Bollers, two-st'y dwell., 276 West Chicago Ave.; cost, $2,700.

L. Kreuder, two-st'y dwell., 138 Centre Ave.; cost, $4,500; architects, Schaube & Berlin; builders, Eich & Otto.

J. Oltens, two-st'y dwell., 727 North Wood St.; cost, $3,600.

G. W. Smale, two-st'y dwell., 3226 Wentworth Ave.; cost, $3,000.

T. Meldrum, two-st'y dwell., 1510 Lake St.; cost, $2,500.

C. Farr, two-st'y dwell., 2803 Emerald Ave.; cost, $2,600.

C. Mayer, two-st'y dwell., 226 Orchard St.; cost, $3,500.

J. L. Alstrin, three-st'y dwell., 447 West Chicago Ave.; cost, $5,500; architect, H. M. Hansen; builders, Lund & Gilbert.

J. Coumpe, two-st'y dwell., 181 California Ave.; cost, $4,000; architect, J. J. Flanders.

W. Hasterlik, two-st'y store and dwell., 216 Dekoven St.; cost, $7,000; architects, Schaub & Berlin.

Mrs. M. E. Butler, two-st'y store and dwell., 819 and 821 Van Buren St.; cost, $2,500.

C. Bean, two-st'y stable, 85 and 87 Thirty-third St.; cost, $4,500.

Geo. Manierre, three-st'y dwell., 61 Bellevue Pl.; cost, $13,000; architects, Cobb & Frost; builder, L. Weick.

Jennings Drying Machine Co., dry kiln, 443 to 449 Johnson St.; cost, $4,000.

A. Miller, three-st'y flats, 37 and 39 Wabash Ave.; cost, $4,000.

M. Civinsi, three-st'y flats, 779 Western Ave.; cost, $6,000.

J. Southwick, three-st'y store and dwell., 401 Van Buren St.; cost, $8,500.

Allen & Snell, two-st'y flats, Idaho St.; cost, $5,500.

A. Knisely, four-st'y addition to factory, 76 and 78 West Monroe St.; cost, $10,000.

Schram Bros., two-st'y factory, 14 Armour St.; cost, $4,000.

J. L. Beckwith, 2 two-st'y dwells., 243 and 245 Park Ave.; cost, $8,000.

Cincinnati.

BUILDING PERMITS. — L. Braun, three-st'y brick building, w s of Coleman St., between Bank and Central Ave.; cost, $3,000.

A. Reutman, three-st'y brick building, 102 and 104 Freeman Ave.; cost, $5,700.

Mrs. Funke, three-st'y brick building, 575 Elm St.; cost, $2,400.

Mrs. H. M. Young, three-st'y brick building, 418 West Seventh St.; cost, $5,000.

Robt. Woodburn, three-st'y brick building, e s of Ohio Ave., s of Calhoun St.; cost, $3,000.

Cost of additions and repairs, $3,200.

Total permits to date, 665.

Total cost to date, $2,631,680.

New York.

There is nothing this week to report. A second scheme to enlarge the "Florence" apartment-house on the n e cor. of Fourth Ave. and Eighteenth St. is spoken of, plans having been drawn by Mr. Montrose W. Morris; but no capitalists will start enterprises in the present condition of the labor strikes.

BUILDING PERMITS. — *Clinton St., No.* 115, four-st'y brick workshop, tin roof, cost, $3,000; owner, Max Lowenthal, 10 Rivington St.; architect, Julius Boekell.

Fifty-fourth St., s s, 175′ e Second Ave., five-st'y brick tenement, tin roof; cost, $13,000; owner, Adolph Kerbs, 1018 Second Ave.; architects, D. & J. Jardine.

Tenth Ave., No. 126, five-st'y brick tenement and store, tin roof; cost, $10,000; owner, John M. Curley, 116 Tenth Ave.; architect, Fred. Jenth; builder, H. M. Reynolds.

East One Hundred and Thirty-seventh St., No. 610, 2 three-st'y brick dwells., tin roofs; cost, total, $14,000; owner, Mrs. Mary Woods, 533 East One Hundred and Fifty-third St.; architect, John C. Burne.

West Fifty-seventh St., Nos. 520 and 522, two-st'y brick engine-house, tin roof; cost, $15,000; owner, Conrad Stein, 521 West Fifty-seventh St.; architect, J. Kastner.

One Hundred and Twenty-fourth St., n s, 150′ e Eighth Ave., one-st'y brick carriage storage, cement roof; cost, $4,000; lessee, W. A. Martin, 128 West One Hundred and Twenty-third St.; architect, John Van Dolsen.

One Hundred and Twenty-third St., n s, 346′ 6″ w Third Ave., 4 five-st'y brick tenements and stores, tin roofs; cost, each, $10,000; owner, Martha Gelston, 160 East One Hundred and Eighteenth St.; architect, J. H. Valentine.

One Hundred and Thirty-fourth St., s s, 400′ and 495′ e Willis Ave., 6 two-st'y brick dwells., tin roofs; cost, each, $5,500; owner and builder, Thomas J. O'Kane, 144 Alexander Avenue; architect, J. H. Valentine.

One Hundred and Fifty-first St., n s, 325′ w Courtland Ave., two-st'y frame dwell., tin roof; cost, $6,000; owner, John Betz, 2059 Third Ave.; architect, J. H. Valentine.

Courtland Ave., w s, 50′ n One Hundred and Fifty-fifth St., three-st'y frame dwell. and store, tin roof; cost, $5,000; owners, John and Wilhelmine Fischer, 725 Courtland Ave.; architect and builder, Ed. Stichler.

East One Hundred and Ninth St., No. 182, four-st'y brick tenement and store, tin roof; cost, $12,000; owner and builder, John W. Warner. One Hundred and Sixth St. and Fifth Ave.; architect, Wm. Graul.

Ninety-third St., 100′ e Ninth Ave., 2 five-st'y brick tenements, tin roofs; cost, each, $24,000; owner, Robert McGinnis, 338 East Eighty-sixth St.; architects, Cleverdon & Putzel.

One Hundred and Thirteenth St., s s, 75′ e Second Ave., three-st'y brick dwell., tin roof; cost, $8,000; owner, Dietrich W. Wehrenberg, 1996 Fourth Ave.; architect, J. H. Valentine.

ALTERATIONS. — *Ninety-eighth St.*, s s, 210′ e Third Ave., repairs, internal and external; cost, $7,000; owner, Richard Claffy, Brooklyn; architect, Elbert D. Howes.

West Fifty-sixth St., Nos. 513 *and* 515, build new chimney-stack and fire-proof boiler-room; cost, $10,000; owner, Conrad Stein, 521 West Fifty-seventh St.; architect, J. Kastner.

West Fifty-sixth St., Nos. 517 *and* 519, internal alterations; cost, $3,000; owner and architect, same as last.

East Thirty-seventh St., No. 126, three-st'y brick extension, tin roof; also, internal alterations; owner, J. W. Kilbreth, Fifth Avenue Hotel; builders, A. A. Andrews & Son and Christie & Dykes.

Philadelphia.

BUILDING PERMITS.— *Broad St.*, n of Fairmount Ave., hall for Bricklayers' Association, 32′ x 74′; A. H. Williams, contractor.

Broad St., s of Ellsworth St., four-st'y dwell., 21′ x 94′; A. H. Williams, contractor.

Maniken St., e of Norris St., two-st'y dwell., 16′ x 32′; Brocklehurst & Ewing.

Jefferson St., e of Ridge Ave., two-st'y dwell., 18′ x 42′; S. Yardley, contractor.

North Sixth St., No. 2434, three-st'y dwell., 18′ x 52′; D. B. Windell, owner.

Kensington Ave., s of Lehigh Ave., 3 three-st'y stores and dwells., 18′ x 48′; J. J. Torpey, owner.

Kensington Ave., No. 2430, three-st'y store and office-building, 22′ x 45′; J. A. Griffes, owner.

Park Ave., s of Norris St., 2 three-st'y dwells., 18′ x 58′; Thomas Logan, contractor.

Park Ave., s of Norris St., three-st'y dwell., 18′ x 58′; Thos. Logan & Bro., contractors.

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Sixteenth St., s of Dickinson St., two-st'y dwell., 16′ x 52′; Alex. Guthrie, contractor.

Chestnut St., e of Fifth St., bank-building, 28′ x 105′; Lewis Havens, contractor.

Cambridge St., n of Orthodox St., 2 two-st'y dwells., 14′ x 30′; Thos. Waters, contractor.

McCallum St., between Carpenter and Mt. Pleasant Sts., 2 three-st'y dwells., 16′ x 45′; Martin Hetzel, contractor.

D St., s of Ontario St., 2 two-st'y dwells., 14′ x 30′; Jos. Parker, contractor.

Clearfield St., between Frankford Ave. and Emerald St., two-st'y dwell., 17′ x 56′; J. S. Baldt & Son, contractors.

Catharine St., e of Fifteenth St., 3 three-st'y dwells., 18′ x 62′; Michael Whelen, contractor.

Broad St., cor. Somerset St., 3 stores, one 16′ x 40′, two 20′ x 40′; Thos. A. Barlow, owner.

Garfield St., n of Main St., 2 two-st'y dwells., 15′ x 45′; Geo. Ancott, owner.

North Fifteenth St., Nos. 228 and 230, foundry, 28′ x 80′; Kemp & Garrison, contractors.

Washington, D. C.

BUILDING PERMITS. — The following permits have been issued since last report, for new buildings worth $3,000 or over: —

N St., bet. Thirty-first and Thirty-second Sts., n w, two-st'y brick dwell., for M. Plater; cost, $7,000; Frey Bros., builders.

T St., bet. Thirteenth and Fourteenth Sts., n w, 2 three-st'y brick dwells., for Geo. W. Cochran; cost, $9,400; W. C. Morrison, builder.

Vermont Ave., bet. N St. and Iowa Circle, three-st'y brick dwell., for Wm. B. Morgan; cost, $12,000; Robt. Stead, architect; W. C. Morrison, builder.

Sixteenth St., cor. H St., n w, three-st'y brick dwell., for Henry Adams; cost, $35,000; H. H. Richardson, architect; Chas. Edmonston, builder.

Sixteenth St., cor. H St., n w, three st'y brick dwell., for John Hay; cost, $70,000; H. H. Richardson, architect; Chas. Edmonston, builder.

Q St., bet. Twentieth and Twenty first Sts., n w, three-st'y brick dwell., for Mrs. Sarah J. Foster; cost, $7,000; F. F. Schneider, architect, C. C. Martin, builder.

K St., bet. Ninth and Tenth Sts., n w, two-st'y brick dwell., for Geo. T. Dearing; cost, $3,000.

N St., bet. Nineteenth and Twentieth Sts., n w, three-st'y brick dwell., for B. F. Tilley; cost, $6,000; J. G. Myers, architect; A. G. Stevens, builder.

Fifteenth St., bet. P and Q Sts., n w, two-st'y brick dwell., for Mrs. J. A. Powell; cost, $3,400; R. W. Darby, builder.

Tokoma Park, County, two-st'y frame dwell., for Geo. E. Kniffin; cost, $3,500; George Emmert, Jr., architect.

Seventh St., bet. D and E Sts., n w, four-st'y brick store, for Jno. L. Vogt; cost, $9,000; Cluss & Schultz, architects; Henry Camrades, builder.

Lanier Heights, County, three-st'y frame dwell., for A. M. McLachlen; cost, $3,000; Jas. G. Hill, architect.

BUILDING INTELLIGENCE.

Intersection of Mass. Ave., cor. Sixth and C Sts., n w, 2 three-st'y brick dwells., for Charles White; cost, $12,000; J. H. McGill, architect.

K St., bet. First and North Capitol Sts., n w, two-st'y brick dwell., for Jno. Newman; cost, $3,200; Peter McCartney, architect and builder.

North Capitol St., cor. P St., n w, two-st'y brick dwell., for W. H. Mohler; cost, $3,500.

R. I. Ave., bet. Fourteenth St. and Iowa Circle, three-st'y brick dwell., for George Gibson; cost, $8,500; Gray & Page, architects; Jno. McGregor, builder.

J St., bet. K and L. Sts., n w, two-st'y brick store, for R. C. Lewis; cost, $6,000.

R. I. Ave., bet. Seventeenth St. and Conn. Ave., n w, three-st'y brick dwell., for Mrs. A. V. Keyworth; cost, $15,000; Robt. Stead, architect; Frey Bros., builders.

Sixth St., cor. M St., n w, 2 two-st'y brick dwells., for C. Bressner; cost, $8,000; C. A. Didden, architect; Aug. Getz, builder.

Twenty-eighth St., bet. P and Q Sts., n w, four-st'y brick dwell., for I. N. Rollins; cost, $12,000; L. S. Chapman, builder.

Md. Ave., bet. Second and Third Sts., n e, three-st'y brick dwell., for N. E. Dawson; cost, $3,250.

Eighteenth St., cor. Mass. Ave., n w, three-st'y brick dwell., for A. W. Quintland; cost, $14,000; Gray & Page, architects; Jno. McGregor, builder.

B St., bet. First St. and Del. Ave., s w, two-st'y brick car stable, for Washington & Georgetown R.R. Co.; cost, $50,000.

Kingman Pl., two-st'y brick dwell., for W. C. Morrison; cost, $4,000.

Water St., n w, frame lime warehouse, for Cammack & Decker; cost, $5,500.

Eleventh St., bet. L and M Sts., n w, two-st'y brick dwell., for W. B. Todd; cost, $3,000; Kenderdine & Paret, builders.

Mount Pleasant, County, two-st'y frame dwell., for J. A. Danforth; cost, $3,000; George Emmert, Jr., architect.

Uniontown, County, two-st'y frame dwell., for H. A. Griswold; cost, $3,000.

D St., bet. First and Second Sts., n w, two-st'y brick dwell., for F. J. Herberger; cost, $3,500; J. G. Myers architect.

PROPOSALS.

PUMPING-ENGINE.

[At Bowling Green, Ky.]

Sealed proposals, addressed to the undersigned, will be received by the Water Commissioners of Bowling Green, Ky., **until October 15, 1884, at noon**, for furnishing, building, and erecting, complete, one compound condensing steam pumping-engine, of two and one half million United States gallons' capacity per twenty-four hours, and also for a non-compound condensing engine of like capacity.

Specifications and further information can be obtained from the undersigned, or from Chas. Hermany, the Consulting Engineer, by addressing him at Louisville, Ky. JAS. H. WILKERSON,

458 Supt. Water Works, Bowling Green, Ky.

PROPOSALS.

RIP-RAP GRANITE.

[At Block Island, R. I.]

ENGINEER OFFICE, U. S. ARMY,
NEWPORT, R. I., October 6, 1884.

Sealed proposals, in duplicate, will be received at this office **until 12 o'clock, noon, on Tuesday, the 28th day of October, 1884**, at which time they will be opened in presence of bidders, for furnishing rip-rap granite for the breakwater at Block Island, R. I., under the appropriation by the Act of Congress of July 5, 1884, of $15,000.

The United States reserves the right to reject any or all proposals.

Specifications, blank proposals, and full information as to the manner of bidding, conditions to be observed by bidders, and terms of contract and payment, will be furnished on application to this office.

GEORGE H. ELLIOT,

461 Lt.-Col. of Engineers.

COURT-HOUSE.

[At Galesburg, Ill.]

OFFICE OF THE COUNTY CLERK,
GALESBURG, ILL., October 3, 1884.

Sealed proposals will be received at this office **till 11 o'clock, A. M., on the 24th day of October, 1884**, for supplying all materials and workmanship, and completing every class of work required in the construction of a new court-house at Galesburg, Ill., to be erected according to the plans, specifications and detail drawings of E. E. Myers, architect, which can be seen upon application at this office.

Bids will be made separately for each class of work, or for the work as a whole, and must be indorsed "Proposals for Building the New Court-House," and be addressed to W. Selden Gale, the Chairman of Building Committee, at Galesburg, Ill., stating the time within which the work bid for shall commence and be finished.

All proposals must be addressed to the undersigned, and no proposal will be considered unless accompanied with a full and complete itemized schedule, and made on the blanks furnished by the county.

The Court-House Committee reserves the right to reject any or all proposals, and to let the work as a whole or separately, as they may deem it best.

W. SELDEN GALE,

460 Chairman of Building Committee.

CROTON AQUEDUCT.

[Near New York, N. Y.]

AQUEDUCT COMMISSION,
ROOM 78, TRIBUNE BUILDING,
NEW YORK, October 3, 1884.

Bids or proposals for constructing Sections A and B of the New Croton Aqueduct in the 24th Ward of the City of New York, will be received at this office **until Wednesday, October 29, 1884, at three o'clock, P. M.**, at which place and hour they will be publicly opened and read by the Aqueduct Commissioners; and the award of the contract will be made by said Commissioners as soon thereafter as practicable.

The portion of the new aqueduct for which bids are hereby invited is in tunnels, and is divided into two sections, viz.: —

Section A, extending from a point near the High Bridge, northward a distance of about 11,850 feet; and having three working shafts.

Section B, extending from the end of Section A northward a distance of about 12,300 feet, and having two working shafts.

Bidders can bid for either one, or for both, of the above sections; but each section must be bid for, and will be awarded separately. Any bidder for both Sections who will not accept an award for one Section only, must so state in his bid.

Each bid must be inclosed in a sealed envelope, indorsed with the name of the person or persons making the same, and the Section for which it is made.

Each bid must state the name and place of residence of the person making the same, and the names of all persons interested with him therein; also that it is made without any connection with any other person making a bid for the same work, and is in all respects fair and without collusion or fraud; that no member of the Aqueduct Commission, or of the Common Council, no head of a Department, Chief of a Bureau, deputy thereof, or clerk therein, or other officer of the Corporation, or any person in the employ of the Aqueduct Commissioners, is directly or indirectly interested in the bid, or in the work to which it relates, or in the profits thereof.

Each bid must be verified by the oath of the party making the same, that the several matters therein stated are true, and must be accompanied by a certified check upon a National or State Bank, of the City of New York, drawn to the order of the Comptroller of the City of New York, for an amount not less than five per cent of the amount of the security required for the faithful performance of the contract. Such check must not be inclosed with the bid or proposal, but must be delivered to the Aqueduct Commissioners, or to their Secretary, for delivery to the Comptroller. All deposits, except that of the successful bidder, will be returned by the Comptroller to the persons making the same within three days after the contract is awarded. If the successful bidder shall neglect or refuse to execute the contract within ten days after notice that it has been awarded to him, the amount of the deposit made by him shall be forfeited to and retained by the City of New York as liquidated damages for such neglect or refusal, pursuant to the provisions of Section 29 of Chapter 490 of the Laws of 1883; but if he shall execute the contract within the time aforesaid, the amount of his deposit will be returned to him.

The amount of security required in the contract for Section A is one hundred and twenty-five thousand dollars; and for Section B, one hundred and thirty-five thousand dollars; with not less than two satisfactory sureties, who must be householders, or resident freeholders, of the State of New York.

The Aqueduct Commissioners reserve the right to reject any and all bids if they deem it for the best interest of the city so to do.

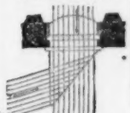
Blank forms of bid or proposal, and proper envelopes for their inclosure; forms of the contract, specifications, and bond, and all other information required, can be obtained at the office of the Aqueduct Commissioners, Room 78, Tribune Building, New York.

By order of the Aqueduct Commissioners.

460 JAMES W. McCULLOH, Secretary.

Sidewalk
— AND —
VAULT LIGHTS.

Sole Manufacturers of the



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PROPOSALS.

STONE AND BRICKWORK.
[At Terre Haute, Ind.]

OFFICE OF SUPERVISING ARCHITECT,
TREASURY DEPARTMENT,
WASHINGTON, D. C., October 6, 1884.

Sealed proposals will be received at this office **until 2 P. M., on the 31st day of October, 1884,** for supplying and setting all the stone-work, and furnishing and laying all the brickwork required for the basement and superstructure of the post-office, etc., building at Terre Haute, Ind., in accordance with drawings and specification, copies of which may be seen and any additional information obtained on application at this office, or the office of the superintendent.

Bids must be accompanied by a certified check, and those received after the time of opening will not be considered.

M. E. BELL,
460 Supervising Architect.

JOINER'S WORK AND WOOD FLOORING.
[At Memphis, Tenn.]

OFFICE OF SUPERVISING ARCHITECT,
TREASURY DEPARTMENT,
WASHINGTON, D. C., October 4, 1884.

Sealed proposals will be received at this office **until 2 o'clock, P.M., on the 20th day of October, 1884,** for furnishing and fixing in place complete, all the joiner's work and wood flooring required for the custom-house and post-office building at Memphis, Tenn., in accordance with drawings and specification, copies of which may be seen, and any additional information obtained on application at this office, or the office of the superintendent.

Bids must be accompanied by a certified check, and those received after the time of opening will not be considered.

M. E. BELL,
460 Supervising Architect.

WORKINGMEN'S HOUSES.
[At Panama, C. A.]

On the 21st of October, 1884, at the office of the Panama Canal Company, in Panama, proposals will be received for the construction of five hundred workingmen's houses. These houses are 33′ x 40′, and are to be built of pitch-pine or Oregon pine, and to contain thirty berths. They are to be distributed in equal proportion in three sections, between Gatun and Gorgona and Culebrara, and Culebrara and Panama, the exact locations to be designated later by the company.

The proposals are not to exceed $1,800, Columbian money, for each house.

For the plans and specifications, address, at Panama, the Director-General of the works; at New York, the Agent of the Company, 18 Broadway. 460

JOINER'S WORK AND WOOD FLOORING.
[At Kansas City, Mo.]

OFFICE OF SUPERVISING ARCHITECT,
TREASURY DEPARTMENT,
WASHINGTON, D. C., September 17, 1884.

Sealed proposals will be received at this office **until 2 P.M., on the 15th day of October, 1884,** for furnishing and fixing in place complete, all the joiner's work and wood flooring required for the custom-house and post-office building at Kansas City, Mo., in accordance with drawings and specification, copies of which and any additional information may be had on application at this office, or the office of the superintendent.

Bids must be accompanied by a certified check, and those received after the time of opening will not be considered.

M. E. BELL,
459 Supervising Architect.

SUPPLIES AND MATERIAL.
[At Memphis, Tenn.]

U. S. ENGINEER OFFICE,
MEMPHIS, TENN., September 25, 1884.

Sealed proposals, in duplicate, will be received **till 12 o'clock, noon, of October 25, 1884,** at this office, for furnishing any or all material required for the Second and Third Districts, Mississippi River, for the fiscal year ending June 30, 1885, consisting of rope, iron, wire, nails, spikes, hardware, castings, oils, paints, lumber.

The probable quantities required will be found in the form furnished. Preference will be given to articles of domestic production.

Bidders are requested to be present at opening of bids. Blank forms for proposals, instructions to bidders and specifications may be obtained by addressing this office. Proposals must be made on forms furnished. The United States reserves the right to reject any or all proposals.

Proposals must be addressed to the undersigned and marked on envelope "Proposals for Supplies and Material, Second and Third Districts, Mississippi River."

460 CLINTON B. SEARS,
Capt. Engineers, U. S. A.

H. W. JOHNS' ASBESTOS LIQUID PAINTS

Our liquid paints *are composed exclusively of the best and purest materials combined on different principles from any other Liquid or Mixed Paints.* They have been thoroughly tested in nearly all parts of the world and have been found to withstand the severest tests of climatic changes, sea air and other trying exposures where the best of white lead has failed, and the universal testimony of those who have used them is sufficient proof of our claims that they are in every respect *strictly reliable and first-class paints* of a *higher grade* than have ever before been offered to the public for structural purposes, either in "paste" or liquid form, and second to none in richness and permanency of color, beauty of finish, durability, uniformity, and all characteristics which are requisite to form a perfect ornamental protective covering.

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These paints possess a more elastic body than any other, and are less liable to injury, and are especially adapted for out-buildings, fences, floors, gas holders and other iron and rough wood-work. They are supplied in seven colors.

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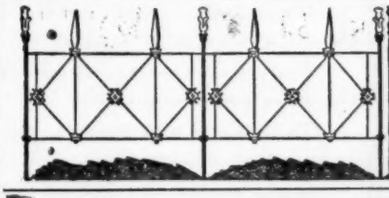

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Visitors' Correspondence may be addressed in care of this establishment.

HENRY LORD GAY, Proprietor. T. S. HOTCHKISS, Manager.

PROPOSALS.

HEADSTONES.
[At Washington, D. C.]

OFFICE OF NATIONAL CEMETERY,
WASHINGTON, D. C., September 27, 1884.

Sealed proposals, in triplicate, with a copy of this advertisement attached to each, will be received at this office **until 12 M., Thursday, November 6, 1884,** for furnishing 4,000 headstones, more or less, of American white marble, for unmarked graves of Union soldiers, under the provisions of the Acts of Congress of March 3, 1873, and February 3, 1879.

Specifications for the work, blank forms of proposals, and all necessary information on the subject will be furnished on application to this office.

Proposals are required to be submitted on the forms supplied for the purpose.

The right is reserved to reject any or all bids.

Bids should be indorsed, "Proposals for Furnishing Headstones," and addressed to the undersigned.

R. N. BATCHELDER,
461 Deputy Quartermaster Gen., U. S. A.

COURT-HOUSE.
[At Muncie, Ind.]

AUDITOR'S OFFICE, DELAWARE COUNTY,
MUNCIE, IND., September 29, 1884.

New sealed proposals will be received at the auditor's office in the City of Muncie, Delaware County, Ind., **until 2 o'clock, P. M., on Thursday, November 6th, 1884,** for furnishing all materials and labor required in the erection and completion of a new court-house in the City of Muncie, for the County of Delaware, State of Indiana, according to plans and specifications for the same as furnished by B. S. Tolan (successor to T. J. Tolan & Son), architect, Ft. Wayne, Ind.

Plans and specifications can be seen at the auditor's office, and the office of the architect, on and after this date.

Said building will be required to be fully finished and completed on or before the first day of July, 1887.

All proposals must be accompanied by a good and satisfactory bond payable to the State of Indiana, in the penal sum of one hundred and fifty thousand dollars ($150,000). Said bond must be certified by the Clerk of the Court of the County in which the sureties reside, that the same is good and sufficient beyond a doubt.

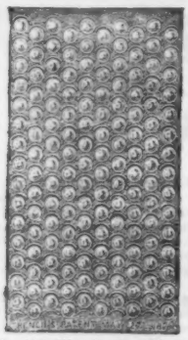
Blank forms for bids, schedules, and bonds, will be furnished by the auditor upon application, and all bids must be made thereon, or the bid will be rejected. Estimates will be made monthly, and ninety per cent of said estimates will be paid according to contract.

The Commissioners reserve the right to reject any or all bids.

Bidders are required to demand printed instructions in regard to changes as directed by the Board of Commissioners, which instructions are to accompany said new sealed proposals, and must become a part of the contract.

By order of the Board of Commissioners.

WILLIAM DRAGOO,
469 Auditor Delaware County.



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Fifty thousand of these popular furnaces in use. Established, 1849. Same address as for twenty years past. Send for Circular.

PROPOSALS.

COURT-HOUSE.

[At Cincinnati, O.]

OFFICE BOARD TRUSTEES TO REBUILD COURT-HOUSE, HAMILTON COUNTY, O.
COURT-HOUSE YARD, CINCINNATI, O., Oct. 1, 1884.

Sealed proposals will be received at this office **until 9 o'clock**, A.M., **on Saturday, the 18th day of October, 1884**, for furnishing and setting in place all the wrought and cast iron work required for the rebuilding of the Hamilton County, Ohio, Court-House, according to plans and specifications on file in this office, and also at the office of James W. McLaughlin, architect, 46 and 47 Johnston Building, Cincinnati.

All bids to be made upon printed forms furnished on application to this office, and subject to all the conditions therein provided. No others will be considered.

The Board reserve the right to reject any and all bids. By order of the Board.

459 J. CLIFFORD GOULD, Clerk.

ORDNANCE SUPPLIES.

[At Rock Island, Ill.]

ROCK ISLAND ARSENAL,
ROCK ISLAND, ILL., September 12, 1884.

Sealed proposals in triplicate, upon the blank forms furnished from this arsenal only, will be received by the undersigned **until 12 o'clock**, M., **on Thursday, October 16, 1884**, at which time they will be publicly opened, for furnishing the following classes of supplies, in such quantities and at such times during the fiscal year ending June 30, 1885, as the commanding officer of this arsenal may require, viz.: blankets, forage, bar iron, steel, brass, iron and copper rivets and burs, wire, nails, leather, thread, cotton duck, stationery, paints, oils, etc. All articles will be subjected to a rigid inspection; full compliance with the specifications will be insisted upon, and no articles of inferior quality will be accepted. The Government reserves the right to reject any or all proposals or parts thereof. A preference will be given to articles of domestic production and manufacture, conditions of price and quality being equal. Forms containing instructions to bidders, a copy of this advertisement, blank form of proposals, and specifications for supplies, with column for prices to be filled by the bidder, can be had upon application by mail or in person to the undersigned, and samples of the supplies can be seen at this arsenal.

Envelopes containing proposals should be marked "Proposals for Ordnance Supplies," and addressed to the undersigned.

Bidders are invited to be present at the opening.

D. W. FLAGLER,
459 Lt.-Colonel of Ordnance, Commanding.

INDUSTRIAL SCHOOL BUILDING.

[At Devil's Lake Agency, Dak.]

DEPARTMENT OF THE INTERIOR,
OFFICE OF INDIAN AFFAIRS,
WASHINGTON, D. C.

Sealed proposals, indorsed "Proposals for the construction of an Industrial School Building at Devil's Lake Agency, Dak.," will be received at the office of the agent of the Devil's Lake Agency, Fort Totten, Dak., **until October 14, at 12 o'clock**, M.

The building is to be frame, 35′ x 100′, two stories. Complete plans and specifications of the work can be examined at the office of the *Inter-Ocean*, of Chicago, Ill., the *Pioneer Press*, of St. Paul, Minn., and at the agency.

The contract to be awarded to the lowest responsible bidder or bidders, subject to the approval of the Secretary of the Interior. The right is, however, reserved to reject any and all bids, or any part of any bid, if deemed for the best interests of the service.

Time required to complete the building will be taken into consideration, and proposals must state the length of time required for the completion of the building after the approval of the contract.

Each bid must give the name of all the parties interested in or parties to it, and a copy of this advertisement must be attached to bid, with post-office address.

Each bid must be accompanied by a certified check or draft upon some United States depository, payable to the order of John W. Cramsie, U. S. Indian agent, which check or draft shall be not less than five per centum on the amount of the bid, and shall be forfeited to the United States in case any bidder receiving an award shall fail to execute promptly a contract with good and sufficient sureties, according to the terms of his bid; otherwise to be returned to the bidder.

Bids not accompanied by a certified check or draft will not be considered.

Parties receiving awards will at once enter into contract.

The contract will provide for three payments, two of which will be made at such stages of the work as will fully protect the United States; the last payment to be made when the building is completed and accepted.

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PROPOSALS.

IMPROVING APPOMATTOX RIVER, VA.

[At Norfolk, Va.]

U. S. ENGINEER OFFICE,
NORFOLK, VA., September 23, 1884.

Sealed proposals, in triplicate, will be received at this office **until noon of October 23, 1884**, and opened immediately thereafter, in the presence of bidders, for dredging one hundred and thirty-five thousand (135,000) cubic yards more or less, and for furnishing small quantities of piles, lumber, gravel, brush, binding poles, bolts, and spikes for the improvement of Appomattox River, Virginia.

Specifications, instructions to bidders, and blanks for proposals can be had on application to this office.

460 F. A. HINMAN, Capt. of Engineers, U.S.A.

DAM.

[Near Frankfort, Ky.]

U. S. ENGINEER OFFICE, 82 WEST THIRD ST.,
CINCINNATI, O., September 1, 1884.

Sealed proposals, in triplicate, will be received at this office **until noon, local time, on Monday, October 20, 1884**, for furnishing all materials and labor for constructing Dam No. 5, Kentucky River, about seventeen miles above Frankfort, Ky.

Approximate estimate of materials: —

126,764 lineal feet of timber,
96,000 pounds of iron, drift-bolts and spikes,
8,359 pounds of iron anchoring-bolts,
19,000 cubic yards of rip-rap stone,
352,588 feet B. M. of sheeting,
6,000 cubic yards of gravel backing.

Specifications, printed forms of proposals, and information will be furnished on application to D. L. Sublett, at Frankfort, Ky., or to the undersigned.

459 JAMES C. POST, Captain of Engineers.

STONE AND BRICK WORK.

[At Council Bluffs, Iowa.]

OFFICE OF SUPERVISING ARCHITECT,
TREASURY DEPARTMENT,
WASHINGTON, D. C., September 27, 1884.

Sealed proposals will be received at this office **until 2 P. M., on the 18th day of October, 1884**, for all the labor and material, stone, brick, mortar, etc., and building complete the basement and area walls of the post-office, etc., building at Council Bluffs, Iowa, in accordance with drawings and specification, copies of which may be seen and any additional information obtained on application at this office or the office of the superintendent.

Bids must be accompanied by a certified check, and those received after the time of opening, will not be considered.

H. G. JACOBS,
459 Acting Supervising Architect.

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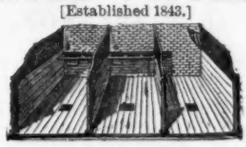

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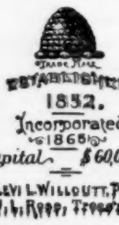

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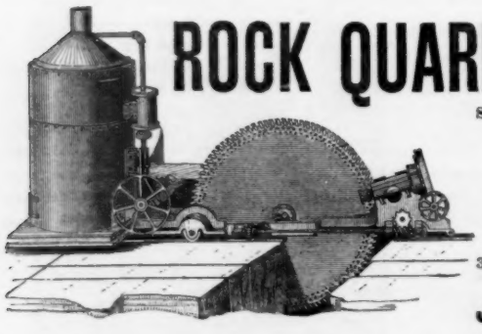
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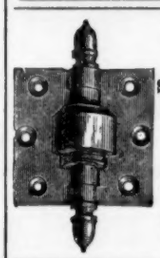

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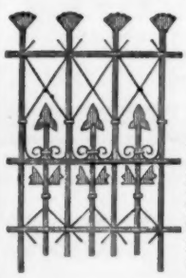

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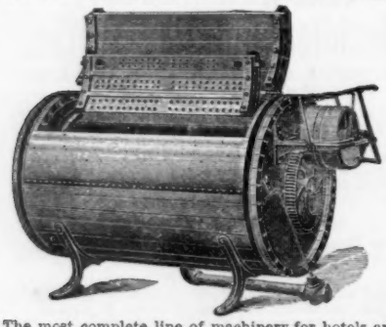

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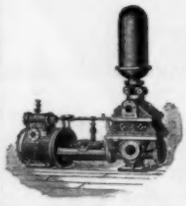

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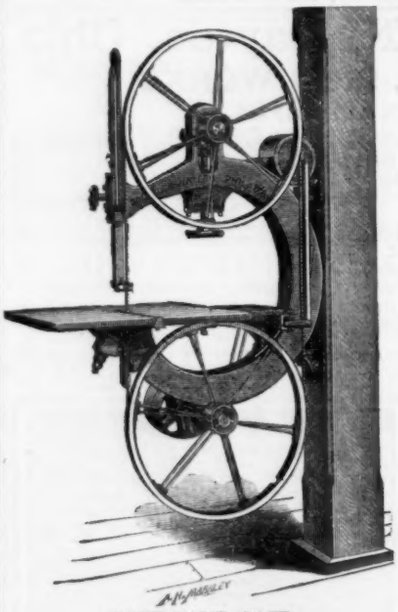

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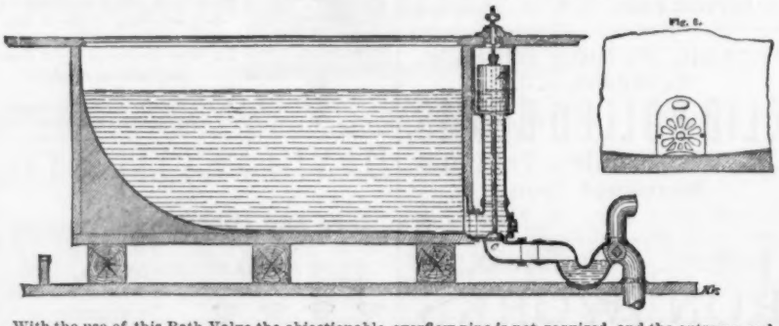

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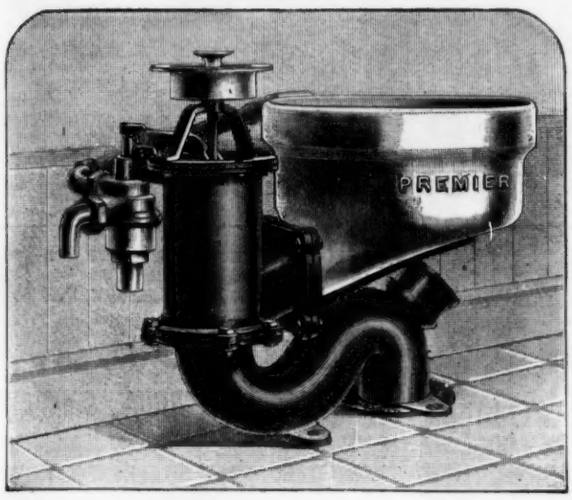

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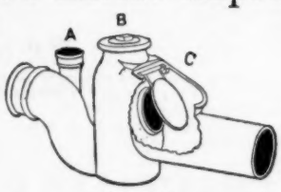

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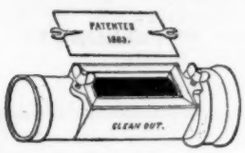

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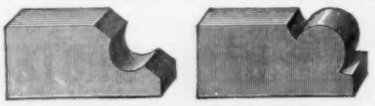

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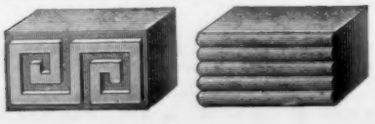

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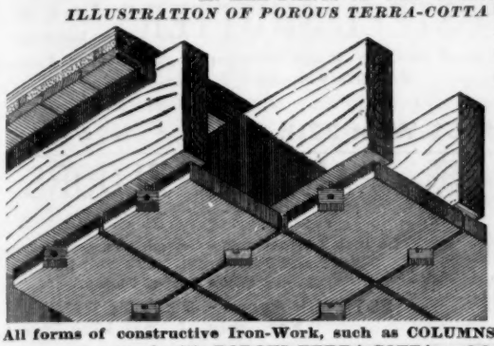

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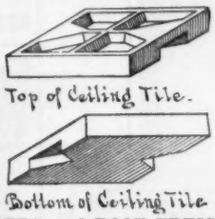

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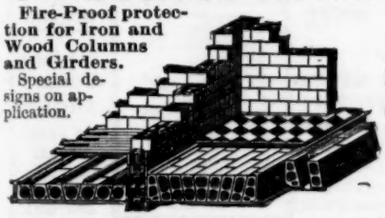

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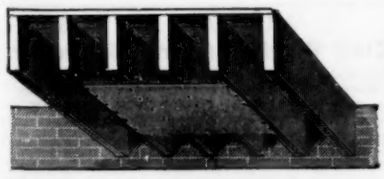

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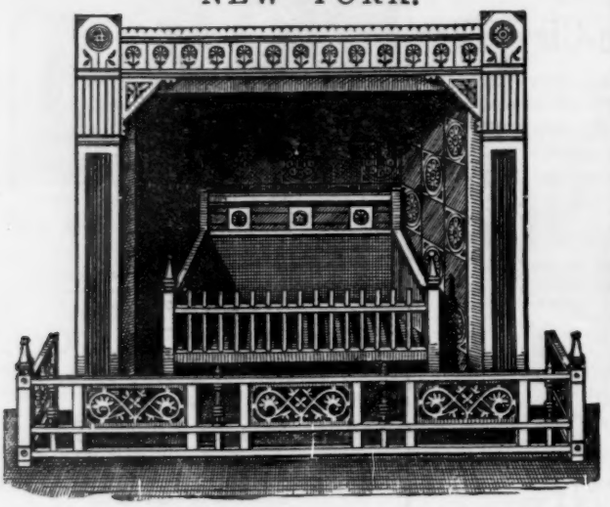

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